

JERUSALEM COLLEGE OF ENGINEERING

(An Autonomous Institution)

Approved by AICTE & Affiliated to Anna University

Accredited by NAAC with 'A' Grade

Chennai – 600 100



DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

B.TECH. ARTIFICIAL INTELLIGENCE & DATA SCIENCE

CURRICULUM

**REGULATION 2023
CHOICE BASED CREDIT SYSTEM**

SEMESTER -I

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JHS2121	English for communicative Competence	I	HS	4	2	0	2	3
2.	JGE2102	Heritage of Tamils	T	HS	1	1	0	0	1
3.	JMA2121	Matrices and Calculus	I	BS	4	2	0	2	3
4.	JPH2101	Engineering Physics 1	T	BS	3	3	0	0	3
5.	JCY2101	Engineering Chemistry	T	BS	3	3	0	0	3
6.	JGE2101	Basic Engineering	T	ES	3	3	0	0	3
7.	JCS2121	Programming in C	I	ES	5	3	0	2	4
8.	JPC2111	Engineering Physics and Chemistry Laboratory	P	BS	2	0	0	2	1
9.	JGE2111	Basic Engineering Laboratory	P	ES	2	0	0	2	1
TOTAL					27	17	0	10	22

SEMESTER- II

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JHS2221	English for Science and Technology	I	HS	4	2	0	2	3
2.	JGE2202	Tamils and Technology	T	HS	1	1	0	0	1
3.	JMA2221	Statistics for Engineers	I	BS	4	2	0	2	3
4.	JPH2201	Engineering Physics 2	T	BS	3	3	0	0	3
5.	JCY2201	Environmental Science and Sustainability	T	BS	2	2	0	0	2
6.	JGE2221	Engineering Graphics	I	ES	4	2	0	2	3
7.	JAD2201	Fundamentals of Data Science	T	PC	3	3	0	0	3
8.	JPC2211	Engineering Physics and Environmental Science Laboratory	P	BS	2	0	0	2	1
9.	JAD2211	Fundamentals of Data Science Laboratory	P	PC	4	0	0	4	2
10.	JGE2241	Gaming Craft Studio	P	EEC	4	0	0	4	2
TOTAL					31	15	0	16	23

SEMESTER- III

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JMA2302	Mathematical Foundations for Computer Science	T	BS	4	2	2	0	3
2.	JAD2321	Data Analytics and Visualization	I	PC	5	3	0	2	4
3.	JCS2301	Data Structures and Algorithm	T	PC	3	3	0	0	3
4.	JIT2321	Digital Principles and Computer Organization	I	PC	5	3	0	2	4
5.	JIT2301	Object Oriented Programming	T	PC	3	3	0	0	3
6.	JNC2361	Disaster Risk Management and Reduction	T	NCM	3	3	0	0	-
7.	JCS2311	Data Structures and Algorithm Laboratory	P	PC	4	0	0	4	2
8.	JIT2311	Object Oriented Programming Laboratory	P	PC	4	0	0	4	2
9.	JPT2041	Soft Skills and Aptitude	P	EEC	2	0	0	2	*
TOTAL					33	17	2	14	21

SEMESTER- IV

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JMA2402	Applied Linear Algebra	T	BS	4	2	2	0	3
2	JAL2401	Principles of Artificial Intelligence	T	PC	3	3	0	0	3
3	JCS2401	Database Management Systems	T	PC	3	3	0	0	3
4	JIT2421	Operating Systems	I	PC	5	3	0	2	4
5	-	Professional Elective 1	T	PE	3	3	0	0	3
6	-	Open Elective 1	T	OE	3	3	0	0	3
7	JAL2411	Principles of Artificial Intelligence Laboratory	P	PC	4	0	0	4	2
8	JCS2411	Database Management Systems Laboratory	P	PC	4	0	0	4	2
9	JPT2041	Soft Skills and Aptitude	P	EEC	2	0	0	2	1
10	JGE2442	Advanced IT Infrastructure Laboratory	P	EEC	4	0	0	4	2
TOTAL					33	17	2	14	26

***Only internal assessment**

SEMESTER- V

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JMA2501	Optimization Techniques	T	BS	4	2	2	0	3
2.	JAL2501	Machine Learning	T	PC	3	3	0	0	3
3.	JCS2501	Computer Networks	T	PC	3	3	0	0	3
4.	JIT2501	Web Applications Framework	T	PC	3	3	0	0	3
5.	-	Professional Elective 2	T	PE	3	3	0	0	3
6.	-	Open Elective 2	T	OE	3	3	0	0	3
7.	JAL2511	Machine Learning laboratory	P	PC	4	0	0	4	2
8.	JPT2042	Technical Skills and Aptitude	P	EEC	2	0	0	2	*
9.	JGE2542	MERN Stack Development Laboratory	P	EEC	4	0	0	4	2
TOTAL					29	17	2	10	22

SEMESTER- VI

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JAD2601	Text and Speech Analysis	T	PC	3	3	0	0	3
2.	JAD2621	Deep Learning	I	PC	5	3	0	2	4
3.	JAD2602	Big Data Management	T	PC	3	3	0	0	3
4.	-	Professional Elective 3	T	PE	3	3	0	0	3
5.	-	Professional Elective 4	T	PE	3	3	0	0	3
6.	-	Open Elective 3	T	OE	3	3	0	0	3
7.	JPT2042	Technical Skills and Aptitude	P	EEC	2	0	0	2	1
8.	JHS2541	Professional Communication	P	HS	2	0	0	2	1
9.	JAD2611	Big Data Management Laboratory	P	PC	4	0	0	4	2
10.	JGE2642	Computational Intelligence Laboratory	P	EEC	4	0	0	4	2
TOTAL					32	18	0	14	25

SEMESTER- VII

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	-	Professional Elective 5	T	PE	3	3	0	0	3
2.	-	Professional Elective 6	T	PE	3	3	0	0	3
3.	-	Open Elective 4	T	OE	3	3	0	0	3
4.	JNC2761	Non-Credit Mandatory Course 2	T	NCM	3	3	0	0	-
5.	JHS2741	Universal Human Values	I	HS	3	1	0	2	2
6.	JGE2751	Entrepreneurship Development	I	EEC	4	2	0	2	3
7.	JAD2741	Comprehension and Technical Seminar	P	EEC	2	0	0	2	1
8	JAD2742	Internship	P	EEC	-	-	-	4**	2
TOTAL					21	15	0	6	17

** Internship of 1 month must be undertaken in Industry through semester 4,5,and 6 leading to 1 credit in semester 7

SEMESTER- VIII

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JAD2831	Project Work	P	PC	20	0	0	20	10
TOTAL					20	0	0	20	10

Total no of credits 166

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CURRICULUM -2023

CHOICE BASED CREDIT SYSTEM

I - VIII SEMESTERS CURRICULUM

COURSE SUMMARY SHEET

S.No	Category	Credits as per Semester								Total Credits
		1	2	3	4	5	6	7	8	
1	HS	4	4	-	-	-	1	2	-	11
2	BS	10	9	3	3	3	-	-	-	28
3	ES	8	3	-	-	-	-	-	-	11
4	PC	-	5	18	14	11	12	-	10	70
5	PE	-	-	-	3	3	6	6	-	18
6	OE	-	-	-	3	3	3	3	-	12
7	EEC	-	2	-	3	2	3	6	-	16
Total		22	23	21	26	22	25	17	10	166
Non-Credit Mandatory				1 sub				1 sub		

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REGULATION 2023

PROFESSIONAL ELECTIVE COURSES:

Vertical I Full Stack development	Vertical II Cyber Security	Vertical III Gaming Technology	Vertical IV Automation Tools	Vertical V IoT
JIT2001 APP Development	JCB2001 -Cyber Security Fundamentals and Practices	JAD2009 AI For Games	JAD2001 Agile Methodologies	JIT2009 Internet of Things: Architecture Protocols And Applications
JIT2002 Cloud Services Management	JCB2002 -Cryptography and Cryptanalysis	JAD2010 Game Theory	JIT2004 Devops	JIT2010 Programming For IOT Boards
JIT2003 UI and UX Design	JCB2003 -Cyber Forensics	JAD2011 Reinforcement Learning For Games	JAD2003 Software Testing using Selenium	JIT2011 Industrial IoT 4.0
JIT2004 Devops	JCB2004 - Intrusion Detection And Prevention	JAD2012 Game Design	JAD2004 Pandas For Data Analysis	JIT2012 IoT in HealthCare
JIT2005 Web Security and Privacy	JCB2005 -Hardware Security	JAD2013 Game Development	JAD2005 Data Visualization Using Tableau	JIT2013 Robotics in IOT
JIT2006 MERN Stack development	JCB2006 -Cloud Security	JAD2014 User Interface Design For Gaming	JAD2006 Jenkins Automation for Server	JIT2014 Mobile Application Development For IOT
JIT2007 Software Testing and Automation	JCB2007 -Ethical Hacking	JAD2015 Augmented Reality / Virtual Reality	JAD2007 Cloud Computing Tools	JIT2015 Cognitive IOT
JIT2008 NoSQL Database	JCB2008 Web Application Security	JAD2016 Cognitive Science And Analyst	JAD2008 Infrastructure Build Tool Using Terraform	JIT2016 Privacy Security for IOT

OPEN ELECTIVES

Sl. No	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
SEMESTER –IV							
1.	JAD9201	Introduction to Data Science	3	3	0	0	3
2.	JAD 9202	Basics of Machine learning	3	3	0	0	3
SEMESTER –V							
3.	JAD 9203	Basics of Data Exploration	3	3	0	0	3
4.	JAD 9204	Data Warehousing	3	3	0	0	3
SEMESTER –VI							
5.	JAD 9205	Introduction to R programming	3	3	0	0	3
6	JAD 9206	Basics of Data Security	3	3	0	0	3
SEMESTER –VII							
7.	JAD 9207	Basics of Game development	3	3	0	0	3
8.	JAD 9208	Ethics in Data Science	3	3	0	0	3

SEMESTER 1

JHS2121	ENGLISH FOR COMMUNICATIVE COMPETENCE	L 2	T 0	P 2	C 3
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COURSE OBJECTIVES:

- To enable the students of Engineering to develop their reading and other language skills
- To facilitate the learners to reflect and share their ideas effortlessly
- To develop their skills to communicate thoughts effectively in social contexts
- To expose them to different genres to develop their understanding and expression
- To train the students to improve their writing skills for efficient communication

UNIT I ANALYTICAL GRAMMAR AND INFORMATION SHARING 12

Parts of speech – Functional units – Tenses – Affixes; Reading comprehension: short general passages for skimming and scanning; Language Practice

Reading: Biographical essays, short stories; **Speaking:** Self-introduction, peer introduction; **Listening:** Inspiring speeches, newscasts; **Writing:** Journal writing

UNIT II FOUNDATIONAL GRAMMAR AND EXPRESSING THOUGHTS 12

Framing questions – Prepositions – Compound nouns – Contextual meaning; Letter writing (informal letters)

Language Practice

Reading: Travelogues; Speaking: Small talks, Just A Minute (JAM); Listening: Anecdotes, stories, podcasts; Writing: Fill in the blanks in short dialogues

UNIT III FUNCTIONAL GRAMMAR AND SOCIAL COMMUNICATION 12

Articles – Subject-verb agreement – Synonyms and antonyms – Email etiquette; Dialogue writing

Language Practice

Reading: Adverts; **Speaking:** Role play, storytelling / completion; **Listening:** Messages from social network; **Writing:** Writing messages for social network / emails

UNIT IV STRUCTURAL GRAMMAR AND VISUAL COMMUNICATION 12

Modal verbs – Simple, complex and compound sentences – Discourse markers – Correction of errors;
Interpretation of posters on social issues

Language Practice

Reading: Excerpts from literature; **Speaking:** Asking for / giving directions - Picture description;

Listening: Talks on English and language skills; **Writing:** Reporting on events
/ incidents

UNIT V TRANSFORMATIONAL GRAMMAR AND WRITTEN COMMUNICATION 12

Degrees of comparison – Reported speech – Connotations – One-word substitutes (general);
Essay writing: narrative / descriptive / expository / argumentative

Language Practice

Reading: Newspaper articles, social media messages (educational contexts); **Speaking:** Group discussions (general topics); **Listening:** Formal and informal talks, Ted talks; **Writing:** Writing short stories / poems (guided)

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- To comprehend reading passages and express themselves
- To communicate their thoughts confidently and skillfully
- To participate in activities of daily life using appropriate communicative strategies
- To be creative and critical in expressing themselves
- To write effectively and persuasively and produce different types of writing

TEXT BOOKS:

1. Department of English, Anna University, English for Engineers & Technologists, Volume 2, Orient BlackSwan Private Limited, Chennai, 2022.
2. Dhanavel, SP. English and Communication Skills for Students of Science and Engineering. Orient BlackSwan Private Limited, Chennai, 2011.
3. Interact English: Lab Manual for Undergraduate Students. Orient BlackSwan Private Limited, Chennai, 2017.

REFERENCE BOOKS:

1. Chellammal, V. Learning to Communicate. Allied Publishing House, New Delhi, 2004.
2. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practices. Oxford University Press, New Delhi. 2015.
3. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2008.
4. Rizvi M, Ashraf. Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

WEB LINKS:

- www.esl-lab.com
- www.englishgrammar.org
- www.englishclub.com
- www.usingenglish.com
- www.esl.about.com
- www.bbc.co.uk/learningenglish/
- <https://esl-bits.net/>
- <https://elt.oup.com/>
- <https://learnenglish.britishcouncil.org>
- <https://quizizz.com/>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	1	-	1	-	1	1	3	-	1
CO2	-	-	-	1	-	1	-	1	1	3	-	1
CO3	-	-	-	1	-	1	-	1	1	3	-	1
CO4	-	-	-	1	-	1	-	1	1	3	-	1
CO5	-	-	-	1	-	1	-	1	1	3	-	1
AVG	-	-	-	1	-	1	-	1	1	3	-	1

JGE2102	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I LANGUAGE AND LITERATURE

3

Language Families in India - Dravidian Languages — Tamil as a Classical Language - Classical Literature in Tamil — Secular Nature of Sangam Literature — Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE-ROCK ART PAINTINGS TO MODERN ART-SCULPTURE

3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS

3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS

3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE

3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India — Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine — Inscriptions & Manuscripts — Print History of Tamil Books.

TOTAL: 15 PERIODS

TEXT BOOKS:

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL — (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.SingaraveIu) (Published by: International Institute of Tamil Studies.

3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)
(Publish by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published
by:International Institute of Tamil Studies.)
5. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by:
Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,
Tamil Nadu)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)
(Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text
Book and Educational Services Corporation, Tamil Nadu)
8. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) — Reference
Book.

JMA2101	MATRICES AND CALCULUS	L T P C
		2 2 0 3

COURSE OBJECTIVES:

- To equip students with the knowledge of matrices required for applications in engineering.
- To enable students understand the concepts of multivariable calculus.
- To introduce concepts of integral calculus as tools required for applications in engineering.
- To familiarize students in the concepts of vector calculus and its applications.
- To help students understand theory of analytic functions and provide knowledge of Cauchy Residue theorem and its applications.

UNIT I MATRICES 9+3

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Reduction of a quadratic form to canonical form – Nature of quadratic forms

UNIT II FUNCTIONS OF SEVERAL VARIABLES 9+3

Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers

UNIT III APPLICATIONS OF INTEGRAL CALCULUS 9+3

Double integrals in Cartesian coordinates – Change of order of integration – Area enclosed by plane curves – Triple integrals – Volume of solids

UNIT IV VECTOR CALCULUS 9+3

Gradient and directional derivative – Divergence and curl – Irrotational and Solenoidal vector fields.

Green's theorem, Gauss' divergence theorem, Stoke's theorem – Verification and evaluation in simple problems

UNIT V COMPLEX ANALYSIS 9+3

Analytic functions – Cauchy-Riemann equations – Milne-Thomson rule (given real or imaginary part) – Bilinear transformation.

Residues – Application of Cauchy's Residue theorem for evaluation of real integrals (Circular contour and semi-circular contour only)

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- To apply matrix method in reducing quadratic form to canonical form.
- To solve simple optimization problems through differential calculus.
- To evaluate multiple integrals required for solving area and volume problems.
- To apply vector calculus for verifying Green's, Gauss' and Stoke's theorems.
- To solve problems arising in analytic functions and solve real integrals through Cauchy Residue theorem.

TEXT BOOKS:

1. Grewal B S, —Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44th Edition, 2018.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, New Delhi, 10th Edition, 2016.
3. Anuradha P and Sudhakar V, "Matrices and Calculus", Scitech Publications, 1st Edition, Chennai, 2019.

REFERENCES:

1. Anton H, Bivens I and Davis S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R K and Iyengar S R K, —Advanced Engineering Mathematics, Narosa Publications, New Delhi, 8th Edition, 2022.
3. Srimantha Pal and Bhunia S C, "Engineering Mathematics" Oxford University Press, 1st Edition, 2015.
4. Weir, M D and Joel Hass, "Thomas Calculus", 15th Edition, Pearson India, 2022.

WEB REFERENCES:

- <https://nptel.ac.in/courses/111107112>
- <https://nptel.ac.in/courses/111108157>
- <https://nptel.ac.in/courses/111107108>
- <https://nptel.ac.in/courses/111106141>
- <https://nptel.ac.in/courses/111103070>

Mapping of CO with PO

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

JPH2101	ENGINEERING PHYSICS I	L T P C 3 0 0 3
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OBJECTIVES:

- To enable the students to understand the basics of Properties of Matter
- To expand their knowledge about thermal properties of materials
- To enhance their understanding of Photonics
- To familiarize the students with the principles of quantum mechanics
- To enrich their knowledge on Solid State of Materials

UNIT I PROPERTIES OF MATTER 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic moduli and tensile strength - Torsion pendulum: theory and experiment - Bending of beams - stress due to bending in beams - bending moment – Cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment.

UNIT II THERMAL PHYSICS 9

Fundamentals of thermal energy - expansion joints – Bimetallic strips - Thermal conductivity, conduction in solids, Differential equation of one dimensional heat flow – Forbes's and Lee's disc method - Conduction through compound media- Solar heater

UNIT III LASERS AND FIBER OPTICS 9

Spontaneous and stimulated emission-Population inversion -Einstein's A and B coefficients derivation – Laser Principle – Nd:YAG and Semiconductor lasers (homojunction & heterojunction) Principle and propagation of light in optical fiber, Derivation of Numerical aperture and Acceptance angle – Fiber optical communication (Block diagram) – Active and passive sensors – Medical endoscope.

UNIT IV BASIC QUANTUM PHYSICS 9

Black body radiation –Planck's theory (derivation) –Deduction of Wien's displacement law and Rayleigh –Jeans' Law from Planck's theory –Compton effect-theory –Properties of Matter waves - Schrödinger's wave equation –Time independent and time dependent equations –Physical significance of wave function –Particle in a one dimensional box –Scanning Transmission electron microscope

UNIT V SOLID STATE PHYSICS 9

Single crystal, Polycrystalline and Amorphous materials – Single Crystals: Unit cell, Crystal systems, Bravais lattices, Directions and Planes in a crystal, Miller indices – Inter planar distances – Co ordination number and Packing factor for SC, BCC, FCC, HCP and Diamond structures - Crystal imperfections: Point defects, Line defects – Burgers vector, Surface defects and Volume defects.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- To apply their knowledge in analyzing the elastic property of any materials
- To assess the thermal properties of materials
- To use modern optical fiber communication systems and tools in real life situations
- To compute problems in Quantum Physics
- To comprehend the structure of solid materials

TEXT BOOKS:

1. Dr. Beula Shanthi John, Dr.P.Mani, —Engineering Physics-II, Dhanam Publications, First Edition, 2019.
2. Bhattacharya, D.K. & Poonam, T. —Engineering Physics- II. Oxford University Press, 2015.
3. Gaur, R.K. & Gupta, S.L. —Engineering Physics. Dhanpat Rai Publishers, 2012.
4. S. O. Pillai, —Solid State Physics, New Age International Publications, Revised Edition.
5. Pandey, B.K. & Chaturvedi, S. —Engineering Physics. Cengage Learning India, 2012.
6. Kittel, C. —Introduction to Solid State Physics. Wiley, 2005

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. —Principles of Physics. Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. —Physics for Scientists and Engineers. Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. —Physics for Scientists and Engineers with Modern Physics.
4. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
5. Arumugam M, "Materials Science", Anuradha Publications, 2015.
6. William F Smith, —Material Science and Engineering, Tata McGraw - Hill Publications, 2008.
7. John D. Cutnell, —Cutnell and Johnson Physics, Wiley Publications, 201

WEBSITE REFERENCES:

- [https:// archive.nptel.ac.in/courses/105/105/105105177/](https://archive.nptel.ac.in/courses/105/105/105105177/)
- [https:// archive.nptel.ac.in/courses/102/105/102105090/](https://archive.nptel.ac.in/courses/102/105/102105090/)
- [https:// archive.nptel.ac.in/courses/108/104/108104113/](https://archive.nptel.ac.in/courses/108/104/108104113/)
- [https:// archive.nptel.ac.in/courses/115/104/115104096/](https://archive.nptel.ac.in/courses/115/104/115104096/)
- [https:// archive.nptel.ac.in/courses/115/104/115104109/](https://archive.nptel.ac.in/courses/115/104/115104109/)

CO-PO Mapping

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

JCY2101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To inculcate the significance of water quality parameters and water treatment techniques.
- To acquaint the properties and applications of industrial polymers.
- To acquire knowledge in corrosion of material and its prevention.
- To import knowledge over energy conversion methods and of energy storage devices.
- To acquire knowledge on the basics of nanomaterials and its preparatory methods.

UNIT 1 WATER AND ITS TREATMENT 9

Water quality parameters (pH, TDS, DO, BOD, COD) - Hardness - Types and estimation (EDTA method). Alkalinity – Types and estimation. Water softening methods- Lime-soda Process (Cold and Hot methods) - Zeolite Process - Ion exchange process. Desalination of brackish water –reverse osmosis. Municipal water treatment- Primary treatment and Disinfection (UV, Ozonation, Chlorination) - Break point chlorination.

UNIT 2 POLYMER AND COMPOSITES 9

Classification of polymers – Functionality – Types of polymerisation (addition & condensation) – Mechanism of addition polymerisation (free radical, cationic, anionic) - Degree of polymerization - Thermoplastic and Thermosetting. Bio degradable polymer- Polyacetic acid, Polyvinyl acetate- Preparation – Properties – applications. Conducting polymer – types – Mechanism – application - Polymer composites – types – properties and application.

UNIT 3 CORROSION AND ITS PREVENTION 9

Corrosion - chemical, electrochemical corrosion, galvanic corrosion and differential aeration corrosion. Factors influencing the rate of corrosion. Corrosion control - material selection, design aspects, cathodic protection, Corrosion inhibitors - Electroplating (copper) and electroless plating (nickel) – Organic coating (Paints – Constituents and function).

UNIT 4 ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear energy- critical mass, light water nuclear power plant and Breeder reactor. Principle, working and applications of solar energy and wind energy. Primary battery (dry cell and alkaline battery). Secondary battery (lead acid, nickel-cadmium and lithium-ion-battery). H₂- O₂ fuel cell.

UNIT 5 NANOCHEMISTRY 9

Distinction between molecules, nanomaterials and bulk materials - Size-dependent properties - Types of nanomaterials - Nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis of nanomaterials – solvothermal, laser ablation, chemical vapour deposition and electrochemical deposition - General applications of nanomaterial.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Identify water quality and propose suitable methods to treat water.
- Analyze the compatibility of polymeric materials for biomedical and electronic applications.
- Recognize the nature of corrosive environment and implement preventive methods of corrosion.
- Design different forms of energy sources for suitable applications.
- Identify suitable synthetic method of nanomaterials for specific applications.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, —Engineering Chemistry, 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., —Engineering Chemistry, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008. S.S. Dara, —A Text book of Engineering Chemistry, S. Chand Publishing, 12th Edition, 2018.
3. A.Ravikrishnan, —Engineering Chemistry, Sri Krishna Hitech Publishing Company Pvt.Ltd., 22nd edition, 2023.

REFERENCES:

1. Shikha Agarwal, —Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, Second Edition, 2019.
2. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, —Text book of nanoscience and nanotechnology, Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
3. S. Ananda Kumar (Editor) "Eco-friendly Nano-hybrid materials for Advanced Engineering Applications" CRC Press, USA. (2016)
4. O.G. Palanna, —Engineering Chemistry, McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
5. B.R.Puri, L.R.Sharma, Madan S.Pathana, Principle of physical chemistry, 47th edition, Vishal publishing Co, 2017.
6. Dara S.S, Umare S.S, —Engineering Chemistry, S. Chand & Company Ltd., New Delhi 2013.

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2. <https://nptel.ac.in/courses/113/106/113106093/>

Mapping of CO with PO

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

JGE2101	BASIC ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide students with illustrations about mechanical engineering to satisfy societal needs
- To provide them knowledge on refrigeration, air-conditioning and power plants
- To help students acquire knowledge in the basics of surveying and building materials
- To impart knowledge on the electric circuits and working principles of Electrical Machines.
- To provide the knowledge on the Principles and characteristics of various electronic devices and measuring instruments.

UNIT I BASICS OF MECHANICAL ENGINEERING 9

Introduction to the concepts of Mechanization and Automation, Robotics - Manufacturing methods - casting, machining, forming operations. Introduction to IC Engine - Working principles of four stroke petrol and diesel engines. Electric vehicle Technology- Layout, components and control.

UNIT II REFRIGERATION,AIR CONDITIONING SYSTEM & POWER PLANT 9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Classification of power plant and working principle of Thermal and Hydel power plant.

UNIT III BASICS OF CIVIL ENGINEERING 9

Introduction to Civil Engineering, Types of buildings, Components of a residential building, Building Materials. Surveying: Objects – Classification – Principles – Measurements of Distances and angles. Rain Water Harvesting, Solid Waste Management

UNIT IV ELECTRIC CIRCUITS AND ELECTRICAL MACHINES 9

Basic circuit components - Ohms Law - Kirchhoff's Law – Introduction to AC circuits - Power and power factor –Construction, Principle of operation and characteristics of DC machines ,Transformers and Induction machines.

UNIT V ELECTRONIC DEVICES & INSTRUMENTATION 9

Types of Materials - N type and P type materials - Principle of operation and Characteristics: PN Junction diode , Zener Diode, BJT, MOSFET. Elements of generalized measurement system – Operating forces– Principle of operation of moving coil and moving iron instruments -Errors in measurement - Standards of Measurement.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able:

- To be acquainted with the concepts in mechanical engineering and vehicle concept.
- To understand the fundamentals of refrigeration, air-conditioning and power plant.
- To summarise the surveying, planning of building, infrastructure and building materials.
- Apply the basic concepts of electric circuits and working principles of electrical machines.
- Gain knowledge on the basics of electronics and choose appropriate instruments for electrical measurement for a specific application.

TEXT BOOKS:

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018.
2. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
3. Sudhakar A and Shyam Mohan SP, —Circuits and Network Analysis and Synthesis, Mc Graw Hill, 2015.
4. D P Kothari and I.J Nagarath, , — Electrical Machines - Basic Electrical and Electronics Engineering, Third Reprint, Mc Graw Hill Education (India) Private Limited, , 2016.
5. A.K.Sawhney, — A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, 2010.
6. S Salivahanan, N Suresh Kumar, "Electronic Devices And Circuits ", fifth Edition, Mc Graw Hill, 2022.

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1. Ramamrutham S., —Basic Civil Engineering, Dhanpat Rai Publishing Co.(P) Ltd, 2013.
2. Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, First edition 2017.
3. Thereja. B.L., — Fundament also f Electrical Engineering and Electronics, S. Chand &Co.Ltd., 2008.
4. H.S.Kalsi, —Electronic Instrumentation — , Tata Mc Graw-Hill, 2

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1. <https://archive.nptel.ac.in/courses/112/103/112103262/>
2. <https://archive.nptel.ac.in/courses/112/105/112105129/>
3. <https://archive.nptel.ac.in/courses/105/106/105106201/>
4. <https://archive.nptel.ac.in/courses/105/106/105106201/>
5. <https://youtu.be/LPcQYXjPdIQ?list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV>
6. https://www.youtube.com/playlist?list=PLMYtBmvT7X7QaLu0b0Jn1QQD4EOuT_CA
7. <https://youtu.be/5ZNeDxfgYAEhttps://youtu.be/36j6hCtL0E>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	-	-	-	-	-	-	-
CO2	1	1	1	1	1	-	-	-	-	-	-	-
CO3	1	1	1	1	1	-	-	-	-	-	-	-
CO4	1	1	1	1	1	-	-	-	-	-	-	-
CO5	1	1	1	1	1	-	-	-	-	-	-	-
AVG	1	1	1	1	1	-	-	-	-	-	-	-

JCS2121	PROGRAMMING IN C	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES

- To understand the concepts of C Language.
- To implement programs using basic constructs of C
- To develop C programs using Arrays and Strings
- To develop modular applications in C using functions and Pointers.
- To be able to use File operations and Structures in C.

UNIT I INTRODUCTION TO C PROGRAMMING

9

Introduction to programming paradigms - Simple model of Computer - Algorithms and Flowcharts - Structure of C program - Applications of C Language - Data Types – Constants - Enumeration - Keywords – Number System.

UNIT II OPERATOR AND EXPRESSIONS

9

Data Input and Output statements – Operators: Arithmetic Operators, Relational Operators, Logical Operators, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation – Decision Making and Branching – Looping statements.

UNIT III ARRAYS AND STRINGS

9

Arrays – Initialization – Declaration – One dimensional array – Two dimensional arrays - String - String operations: length, compare, concatenate, copy – Arrays of strings - Simple programs: Sorting, Searching and Matrix operations.

UNIT IV FUNCTIONS AND POINTERS

9

Function – Definition of function – Function Prototypes - Pass by value - Pass by reference - Recursion. Pointers: Definition- Initialization -Pointer Arithmetic- Pointers and Arrays.

UNIT V STRUCTURES, UNION AND FILES

9

Structure - Structure Definition - Structure Declaration - Nested structures - Array of structures - Union - Storage Classes - Files - Types of file processing: Sequential access, Random access - Sequential access file - Random access file - Command line arguments.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Usage of Basic Linux commands.
2. C Programming using Simple I/O Statements, operators and expressions.
3. C Programming using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings.
6. C Programming using user defined functions (Pass by value and Pass by reference).
7. C Programming using Recursion.
8. C Programming using Pointers and Array of Pointers.
9. C Programming using structures and union.

10. C Programming using storage classes.
11. C Programming using Files.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able:

- Develop efficient algorithms for solving a problem.
- Develop simple applications using various operators in C.
- Design and Implement applications using Array and Strings.
- Develop applications using Functions and Pointers.
- Design and Develop applications using Structures and Files.

TEXT BOOKS

1. Paul J. Deitel, Harvey M. Deitel, —C: How to Program, 9th Edition, Prentice Hall.
2. Reema Thareja, —Programming in C, Oxford University Press, Second Edition, 2016.
3. E. Balaguruswamy, —Programming in ANSI C, 8th Edition, 2019, McGraw Hill Education.
4. Yashavant P. Kanetkar. —Let Us C, BPB Publications, 16th edition 2017.

REFERENCE BOOKS

1. Pradip Dey, Manas Ghosh, —Programming in C, 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
2. Kernighan B.W and Dennis M. Ritchie, —The C Programming Language, 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
3. Jacqueline A Jones and Keith Harrow, —Problem Solving with C, Pearson Education. ISBN: 978-93-325-3800-9.
4. PradipDey, ManasGhosh, —Programming in C - As per the latest AICTE syllabus, First Edition, Oxford University Press, 2018.
5. Byron S Gottfried, —Programming with C, Schaum's Outlines, Third Edition, McGraw- Hill, 2010.

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1. <http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html>
2. <https://nptel.ac.in/courses/106/105/106105171/>
3. <https://www.w3resource.com/c-programming-exercises/>
4. <https://www.programiz.com/c-programming/c-structures-pointers>
5. <https://www.sitesbay.com/cprogramming/c-applications>

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2
CO1	2	2	2	2	-	-	-	3	2	2	-	2
CO2	3	3	3	3	-	-	-	3	3	3	-	3
CO3	3	3	3	3	-	-	-	3	3	3	-	3
CO4	3	3	3	3	-	-	-	3	3	3	-	3
CO5	3	3	3	3	-	-	-	3	3	3	-	3

JPC2111	ENGINEERING PHYSICS AND CHEMISTRY LABORATORY	L 0	T 0	P 2	C 1
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OBJECTIVES:

To provide students the first-hand experience of verifying various concepts learnt in theory courses.

LIST OF EXPERIMENTS

1. Determination of Young's Modulus for the given Uniform bar by Uniform Bending method
2. Determination of Moment of Inertia of the given Circular disc and Rigidity Modulus of thin metal wire using Torsional Pendulum
3. Determination of Planck's constant using different color filters
4. Determine the Wavelength of Mercury Spectrum using Spectrometer.
5. Determine the Thermal conductivity of a Bad conductor using Lee's Disc
6. Determination of Wavelength of the Diode Laser and hence determine the Size of the coated powder particle
7. Estimation of Alkalinity of Water Sample.
8. Estimation of Total, Temporary and Permanent Hardness of Water by EDTA method.
9. Determination of Molecular Weight of a Polymer by Viscosity Average method
10. Estimation of Amount of an Acid by Conductometric Titration
11. Estimation of Ferrous ions by Potentiometric Titration
12. Estimation of Amount of Hydrochloric Acid using pH Meter.

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

1. Evaluate elasticity of a linear body.
2. Discriminate different wavelengths of optical spectrum and the behavior of particles and waves at the atomic scale.
3. Identify the materials which are utilized for thermal insulation.
4. Estimate and analyze the amount of hardness and alkalinity in water for domestic consumption.
5. Apply the principles of conductivity and viscosity of substances in aqueous solutions for quantitative analysis using analytical instruments.

REFERENCES:

1. D. Bailey and E. Wright, Practical Fiber Optics, 2003.
2. Jerrad H.G. and Mc Neil D.B. -Theoretical and Experimental Physics.
3. Fretter W.B. -Introduction to Experimental Physics.
4. J. Mendham, RC Denney, JD Barnes, MJK Thomas, Text book of quantitative chemical analysis, Vogel's, 2008.

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1. <https://www.jhotpotinfo.com/2020/02/determination-of-youngs-modulus-of-bar.html>
2. <https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1518&cnt=1>
3. <https://vlab.amrita.edu/?sub=1&brch=281&sim=851&cnt=2>
4. http://sites.iiserpune.ac.in/~bhasbapat/phy221_files/Lee%27s%20Method.pdf
5. https://edisciplinas.usp.br/pluginfile.php/4212400/mod_resource/content/0/Duniv ant%2021.pdf
6. [https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_A_Molecular_Approach_\(Tro\)/17%3A_Aqueous_Ionic_Equilibrium/17.04%3A_Titrations_and_pH](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_A_Molecular_Approach_(Tro)/17%3A_Aqueous_Ionic_Equilibrium/17.04%3A_Titrations_and_pH)

Mapping of CO with PO

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

JGE2111	BASIC ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To provide an exposure to students with hands-on experience on various basic engineering practices in Civil, Mechanical Engineering
- To impart knowledge on creativity, ideation and realize the importance of team working
- To gain knowledge through experience in handling of engineering aggregates.
- To appreciate the use of various mechanisms involved in engineering products like vehicles.
- To provide exposure to the students with hands-on experience on various basic engineering practices in Electrical and Electronics Engineering
- To kindle your own creativity, ideation and realize the importance of team working.
- To gain knowledge through experience in handling of engineering aggregates.
-

GROUP A

I CIVIL ENGINEERING PRACTICE

BUILDINGS:

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

PLUMBINGWORKS:

- a) Study of pipe line joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- b) Hands-on-exercise: Basic pipe connections - Mixed pipe material connection Pipe connections with different joining components.

II MECHANICAL ENGINEERING PRACTICE

WELDING AND DRILLING

- (a) Preparation of but joints, lap joints and T-joints by Shielded metal arc welding.
- (b) Drilling Practice

TWO WHEELER DISMANTLING AND DIAGNOSIS

- a. Brake Adjustment and Replacing
- b. Chain Adjustment and lubrication
- c. Air Filter and Spark plug Cleaning

- d. Engine oil Replacement and Carburetor Tuning

STUDY AND DEMONSTRATION ON:

- (a) Study of Lathe Machine, tools and components, Safety aspects
- (b) Study of Sheet Metal work, tools and components, Safety aspects

GROUP B (ELECTRICAL & ELECTRONICS)

I ELECTRICAL ENGINEERING PRACTICE

8

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Staircase wiring
4. Measurement of electrical quantities -voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

II ELECTRONICS ENGINEERING PRACTICE

7

1. Study of Electronic components and equipment's - Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

COURSE OUTCOMES:

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

- To fabricate carpentry components and pipe connections including plumbing works.
- To weld various joints in steel plates using arc welding work.
- To understand various mechanism involved in automobiles.
- To illustrate on lathe machine and sheet metal work.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices.

WEBSITE REFERENCE:

- <https://nptel.ac.in/courses/107106088>
- www.vikaspublishing.com/engineering-practices-lab
- <https://archive.org/mechanicalengineeringworkshoplaboratory>
- <https://nptel.ac.in/courses/107106088>
- www.vikaspublishing.com/engineering-practices-lab
- <https://archive.org/mechanicalengineeringworkshoplaboratory>

CO-PO & PSO MAPPING

CO\PO & PSO	PROGRAM OUTCOME														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	-	-	-	1	1	-	-
CO2	1	1	1	1	1	-	-	-	-	-	-	2	1	-	2
CO3	1	1	1	1	1	-	-	-	-	-	-	1	1	-	-
CO4	1	1	1	1	1	-	-	-	-	-	-	1	-	-	-
CO5	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-
AVG	1	1	1	1	1	-	-	-	-	-	-	1	1	-	2

SEMESTER 2

JHS2221	ENGLISH FOR SCIENCE AND TECHNOLOGY (COMMON TO ALL BRANCHES)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To enable the students of Engineering to comprehend technical texts
- To improve their technical writing skill for better transmission of messages
- To help them acquire language skills required in academic and workplace contexts
- To facilitate them to hone their skills to prepare effective reports
- To equip them with effective communicative skills to meet their future needs

UNIT I	COMMUNICATING TECHNICAL INFORMATION	12
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Definitions – Conditional clauses – Technical vocabulary; Comprehension of short technical passage and note-making

Language Practice

Reading: Short technical texts / excerpts; **Speaking:** Interviewing on social or global issues; **Listening:** Talks on science, engineering, medicine / interviews of achievers; **Writing:** Sentence Completion, gap filling, verbal aptitude: sentence correction

UNIT II GRAPHICAL ANALYSIS AND INTERPRETATION 12

Purpose statements – Numerical adjectives – Collocation; Process Description - Interpretation of Graphs and Charts

Language Practice

Reading: Emails, invitations; **Speaking:** Describing charts and tables; **Listening:** Process descriptions; **Writing:** Paraphrasing – Developing outlines

UNIT II PERSUASIVE WRITING & INFORMATION DISSEMINATION 12

Cause and effect – Voice (active, personal and impersonal passive) – Words used as nouns and verbs; Instructions – Recommendations

Language Practice

Reading: User manuals, gadget reviews; **Speaking:** Presentation on social / technical topics;
Listening: Announcements, instructions; **Writing:** Instructions – Recommendations

UNIT IV REPORT WRITING AND GROUP INTERACTION

12

Determiners – Editing - Initialisms and acronyms; Report writing: survey, accident – Minutes of meeting

Language Practice

Reading: Notices, reviews; **Speaking:** Group discussions (technical topics) and debates;

Listening: IELTS and TOEFL; **Writing:** Writing profiles of personalities and industries

UNIT V CAREER AND BUSINESS COMMUNICATION

12

Adverbials – Misspelt words – Formal and informal English; Letter writing – Job application and resume by mail and email – Inviting and sending quotations and placing orders

Language Practice

Reading: Email invitations to job interviews; **Speaking:** About future / career; **Listening:**

Talks by entrepreneurs; **Writing:** Career objective, short-term and long-term goals, tagline

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- To read and understand different types of technical texts
- To write procedural texts logically and sequentially in English
- To communicate effectively in academic and professional contexts
- To prepare effective reports and participate in group activities
- To use language precisely and accurately in business relations

TEXT BOOKS:

4. Department of English, Anna University, English for Engineers & Technologists, Volume 2, Orient BlackSwan Private Limited, Chennai, 2022.
5. Dhanavel, SP. English and Communication Skills for Students of Science and Engineering. Orient BlackSwan Private Limited, Chennai, 2011.
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5. Chellammal, V. Learning to Communicate. Allied Publishing House, New Delhi, 2004.
6. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practices. Oxford University Press, New Delhi. 2015.
7. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2008.
8. Rizvi M, Ashraf. Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

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- www.englishgrammar.org
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- www.usingenglish.com
- www.esl.about.com
- www.bbc.co.uk/learningenglish/
- <https://esl-bits.net/>
- <https://elt.oup.com/>
- <https://learnenglish.britishcouncil.org>
- <https://quizizz.com/>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	1	-	1	-	1	1	3	-	1
CO2	-	-	-	1	-	1	-	1	1	3	-	1
CO3	-	-	-	1	-	1	-	1	1	3	-	1
CO4	-	-	-	1	-	1	-	1	1	3	-	1
CO5	-	-	-	1	-	1	-	1	1	3	-	1
AVG	-	-	-	1	-	1	-	1	1	3	-	1

JGE2202	TAMILS AND TECHNOLOGY	L T P C
		1 0 0 1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW) - Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age - Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel - Copper and gold- Coins as source of history - Minting of Coins - Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl-Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing - Digitalization of Tamil Books - Development of Tamil Software - Tamil Virtual Academy- Tamil Digital Library- Online Tamil Dictionaries - Sorkuvai Project.

TOTAL: 15 PERIODS

TEXT BOOKS:

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL — (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.SingaraveIu) (Published by: International Institute of Tamil Studies.

3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Publish by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:International Institute of Tamil Studies.)
5. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) — Reference Book.

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- To solve problems of discrete and continuous type random variables for finding mean and variance.
- To apply standard probability distributions in solving real time problems.
- To solve correlation problems and to use regression analysis for predicting values of variables.
- To apply hypothesis testing for making statistical inferences in large and small sample real life problems.
- To compare and contrast various design of experiments methods and use them in problems.

TEXT BOOKS:

1. Gupta S C and Kapoor V K, —Fundamentals of Mathematical Statistics, Sultan Chand and Sons, 12th Edition, 2020.
2. Ibe O C, "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Edition, 2014.
3. Johnson R A, —Miller & Freund's Probability and Statistics for Engineers, Pearson Education, Asia, 9th Edition, 2018.

REFERENCES:

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 3rd Edition 2014.
2. Trivedi K S, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2nd Edition, 2016.

WEB REFERENCES:

- <https://nptel.ac.in/courses/117105085>
- <https://nptel.ac.in/courses/111105041>
- <https://nptel.ac.in/courses/102101056>
- <https://nptel.ac.in/courses/102106051>

Mapping of CO with PO

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

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- To be familiar with the functioning of semiconductors
- To assess the magnetic properties of materials
- To make use of superconductors in real life situations
- To understand the nuances of advanced solid state physics
- To recognize the uses of Nano electronic materials

TEXT BOOKS:

1. Dr.P.Mani, —Engineering Physics – III, DhanamPublications, First Edition,2019.
2. Dr.G.Senthil Kumar —Engineering Physics – III, VRB Publications, Revised Edition 2018.
3. Gaur, R.K. & Gupta, S.L. —Engineering Physics. Dhanpat Rai Publishers, 2012.
4. S.O.Pillai, —Solid State Physics, New Age International Publications, Revised Edition.
5. Bhattacharya, D.K. & Poonam, T. —Engineering Physics. Oxford University Press,2015.
6. Pandey, B.K. & Chaturvedi, S. —Engineering Physics. Cengage Learning India,2012.

REFERENCES:

1. R. Murugesan, —Modern Physics, Sultan chand & sons, 2021.
2. Halliday, D., Resnick, R. & Walker, J. —Principles of Physics. Wiley, 2020.
3. Serway, R.A. & Jewett, J.W. —Physics for Scientists and Engineers. Cengage Learning,2017.
4. Tipler, P.A. & Mosca, G. —Physics for Scientists and Engineers with ModernPhysics‘.
5. Willam F Smith, —Material Science and Engineering, Tata McGraw - HillPublications, 4th Edition.

WEBSITE REFERENCES:

- <https://archive.nptel.ac.in/courses/108/108/108108122/>
- <https://archive.nptel.ac.in/courses/115/103/115103038/>
- <https://archive.nptel.ac.in/courses/115/103/115103108/>
- https://www.brainkart.com/article/Dielectric-Materials_6827/
- <https://archive.nptel.ac.in/courses/117/108/117108047/>

CO-PO Mapping

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

JCY2201	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To study the inter-relationship between living organisms and environment.
- To learn causes, effects and preventive methods of environmental pollution.
- To import knowledge on the needs of renewable and new energy sources.
- To acquire broad knowledge on sustainable development and its values on society.
- To expertise sustainability practices of sustainable habitat, sustainable energy and Green engineering.

UNIT 1 ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Biodiversity – Types and values. India as a mega- diversity nation – hot-spots of biodiversity - endangered and endemic species of India - threats to biodiversity – conservation of biodiversity - In-situ and ex-situ - Field visit

UNIT 2 ENVIRONMENTAL POLLUTION 6

Causes, Effects and preventive measures of water, air, soil and thermal pollution. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection acts - Field visit

UNIT 3 RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation – Need of new energy sources - Applications of- Hydrogen energy - Ocean energy resources - Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT 4 SUSTAINABLE DEVELOPMENT 6

Sustainability- concept, needs and challenges- economic and social aspects of sustainability - millennium development goals and protocols- Sustainable Development Goals - targets, indicators and intervention areas. Climate change - Global, Regional and local environmental issues and possible solutions - case studies. Concept of carbon credit and carbon footprint.

Zero waste and 3R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency and sustainable transports. Sustainable energy: Energy Cycles - carbon cycle, emission and sequestration. Green Engineering: Sustainable urbanization - Socio-economic and technological change.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Recognize the function of ecosystem and contribute to conservation of biodiversity.
- Identify the causes and effects of environmental pollution and practice the preventive measures.
- Recognize various types of new renewable sources of energy and their potential applications.
- Apply the sustainable development goals for technological advancement and societal development.
- Adopt sustainability practices for energy efficiency and sustainable urbanization.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's —Perspectives in Environmental Studies, 6th Edition, New Age International Publishers, 2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Sanjay K Sharma, Green Corrosion Chemistry and Engineering: Opportunities and challenges, Wiley-VCH Verlag GmbH & Co. KGaA, Germany (2011)
4. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. Edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha —Textbook of Environmental Studies for Undergraduate Courses, Orient Blackswan Pvt. Ltd. 2013.

Related Links

1. <https://www.hzu.edu.in/bed/E%20V%20S.pdf>
2. <https://catalogimages.wiley.com/images/db/pdf/9781119582052.excerpt.pdf>
3. <https://ncert.nic.in/textbook/pdf/keec109.pdf>

CO-PO Mapping

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

JGE2221	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To acquaint students with the importance of graphics in engineering
- To develop their skills in the preparation of basic drawing
- To improve their technical communication skill in the form of communicative drawing
- To impart knowledge about standard principle of orthographic projection of objects
- To improve their visualization skills for developing new products

UNIT I CONIC SECTIONS AND SPECIAL CURVES

12

Conics - Construction of ellipse, Parabola and hyperbola by eccentricity method, Rectangle method- Drawing of tangents and normal to the above curves.

Special curves: Cycloid-Involute-Drawing of tangents and normal to the curves.

UNIT II PROJECTION PLANE SURFACES & ORTHOGRAPHIC PROJECTIONS

12

Introduction to Points, Lines (Only theory not for Exam Practice) – Projection of Plane Surfaces- Projection of polygonal surface and circular lamina inclined to both reference planes.

Representation of Three Dimensional objects - General principles of orthographic projection – Need for importance of multiple views and their placement - First angle projection - layout views - Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT III- PROJECTION OF SOLIDS

12

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

UNIT IV DEVELOPMENT OF SURFACES

12

Introduction to Section of Solids (Only theory not for Exam Practice)

Development of lateral surfaces of simple and truncated solids - Prisms, pyramids, cylinders and cones

Principles of isometric projection – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Conversion of orthographic views into Isometric Drawing (Simple Objects) - Perspective projection of prisms and pyramids by visual ray method.

TOTAL: 60 PERIODS**COURSE OUTCOMES:**

On successful completion of this course, the student will be able

- To be familiar with the fundamental and standards of engineering graphics.
- To perform free hand sketching of basic geometrical constructions and multiple views of object.
- To project orthographic projections of lines and plane surfaces.
- To draw projection of solids and development of surfaces.
- To interpret isometric and perspective view of objects.

TEXT BOOKS:

1. Natrajan K.V., —A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2018.
2. Venugopal K and Prabhu Raja V., —Engineering Graphics, New Age International (P) Limited, 2016.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., —Engineering Drawing, Charotar Publishing House, 53rd Edition, 2019.
2. Gopalakrishna K.R., —Engineering Drawing (Vol. I & II combined), Subhas Stores, Bangalore, 2017..
3. Shah M.B and Rana B.C., —Engineering Drawing, Pearson, 2nd Edition, 2009.
4. Publication of Bureau of Indian Standards (BIS):
 - i. IS 10711 - 2001: Technical products Documentation - Size and lay out of drawing sheets.
 - ii. IS 9609 (Parts 0 & 1) - 2001: Technical products Documentation - Lettering.
 - iii. IS 10714 (Part 20) - 2001 & SP 46 - 2003: Lines for technical drawings.
 - iv. IS 11669 - 1986 & SP 46 - 2003: Dimensioning of Technical Drawings.
 - v. IS 15021 (Parts 1 to 4) - 2001: Technical drawings - Projection Method

Website References:

1. [www.pdfdrive.com/engineering drawing-books.html](http://www.pdfdrive.com/engineering-drawing-books.html)
2. <https://freevideolectures.com>
3. <https://nptel.ac.in/courses>

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	-	-	-	-	-	-	-
CO2	1	1	1	1	-	-	-	-	-	-	-	-
CO3	1	1	1	1	-	-	-	-	-	-	-	-
CO4	1	1	1	1	-	-	-	-	-	-	-	-
CO5	1	1	1	1	-	-	-	-	-	-	-	-
AVG	1	1	1	1	-	-	-	-	-	-	-	-

JAD2201	FUNDAMENTALS OF DATA SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the basics of Python Programming Language.
- To understand the decision making and looping concepts.
- To understand functions, strings and list in Python.
- Understand the NumPy package features with arrays
- To understand the pandas package with function application.

UNIT 1 BASICS OF PYTHON 9

Python Operators, Operator Precedence, Decision Making: if Statement, if else Statement, if elif else Statement, nested if Statement, Loops: while loop, for loop, nested loops; Loop Control Statements: continue Statement, break Statement, pass Statement: Iterator and Generator

UNIT 2 FILE HANDLING AND EXCEPTION HANDLING 9

Functions: Pre defined Functions, User defined Functions, Recursion, Lambda Function; String: Functions, methods, modules; Lists: Operations, pre-defined functions, advanced list processing; Packages

UNIT 3 TUPLES, DICTIONARY, FILES 9

Tuples: Tuple Operations and methods, Dictionary: Dictionary Operations and methods; Files: Text Files, Reading and writing Files; Format Operator, Command line argument

UNIT 4 NUMPY PACKAGES 9

NumPy ndarray - Array Indexing and Slicing - Arithmetic operation in NumPy - Transposing Array and Swapping Axes - Universal Function in NumPy Array – Boolean Array- Sort, Unique & Set operation in NumPy Array-Saving and Loading Array - Reading CSV files with NumPy

UNIT 5 PANDAS PACKAGES 9

Series and DataFrame data structures in pandas - Creation of Data Frames – Panda's Index Objects- Dropping entries from Series and Data Frames -Indexing, Selection and Filtering in Series and Data Frames - Arithmetic Operations between Data Frames and Series.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able

- Understand Python operators and their usage.
- Gain knowledge of file handling, including reading from and writing to files.
- Understand tuples and their operations, including methods for manipulation.
- Understand the NumPy package and its features
- Understand the Pandas package and its features and to create the dataframe.

TEXTBOOKS

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016
2. William Mckinney, —Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, O‘Reilly 2nd Edition

REFERENCES

1. Gowrishanker and Veena, —Introduction to Python Programming, CRC Press, 2019.
2. Eric Matthes —Python Crash Course, 2nd Edition- May 2019
3. Leo Chin and Tanmay Dutta, —NumPy Essentials, April 2016
4. Kenneth A. Lambert, (2011), —The Fundamentals of Python: First Programs, Cengage Learning

WEB SITE REFERENCES

- <https://www.udemy.com/course/python-for-data-analysis-numpy-pandas-matplotlib-seaborn/>
- <https://www.geeksforgeeks.org/python-exception-handling/>
- <https://www.geeksforgeeks.org/python-classes-and-objects/>
- <https://www.udemy.com/course/python-for-data-analysis-numpy-pandas>

CO-PO Mapping

	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	3	-	-	3	-	-	3	3	3
CO2	3	3	-	-	-	3	-	-	3	-	-	3	3	3
CO3	3	3	-	-	-	3	-	-	3	-	-	3	3	3
CO4	3	3	-	-	-	3	-	-	3	-	-	3	3	3
CO5	3	3	3	-	-	3	-	-	3	-	-	3	3	3
AVG	3	3	3	-	-	3	-	-	3	-	-	3	3	3

JPC2211	ENGINEERING PHYSICS AND ENVIRONMENTAL SCIENCE LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide students the first hand experience of verifying various concepts learnt in theory courses.

LIST OF EXPERIMENTS:

1. Determination of Numerical Aperture of the given Fiber and Estimate the Linearity of the Laser Source.
2. Determine the Dispersive power of a given Prism using Spectrometer
3. Determination of Thickness of the given thin Wire by forming Interference fringes using air-wedge setup
4. Analysis of I-V Characterization of Solar cell
5. Determination of Energy gap of the given Semiconductor Diode by plotting the graph between current and temperature.
6. Determination of Young's Modulus for the given bar by Nonuniform Bending method.
7. Determination of Dissolved oxygen by Winkler's method
8. Estimation of amount of chloride in water.
9. Estimation of the amount of mixture of acids in water
10. Estimation of Iron content in water by Spectrophotometric method
11. Estimation of acetic acid adsorbed on charcoal.
12. Determination of per capita energy consumption and carbon footprint.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

1. To lucid the effective communication system and to scrutiny the required wavelength.
2. To quantify micro sized linear objects and to ascertain band gap of semiconducting materials.
3. To configure solar power system as close as possible to its maximum peak power point.
4. To quantify the degree of pollution of water samples by measuring water quality parameters.
5. To carry out energy audit and practice energy conservation methods.

REFERENCES

1. D. Bailey and E. Wright, Practical Fiber Optics, Newnes publications, 2003.
2. Fretter W.B. -Introduction to Experimental Physics UCL Press, 2005
3. Gurdeep R. Chatwal, Sham K. Anand, Instrumental methods of chemical analysis, Himalaya Publishing House, 2007.

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1. <https://vlab.amrita.edu/?sub=1&brch=281&sim=851&cnt=2>
2. <https://anilpangantiwar.tripod.com/expt10.htm>
3. <https://praxilabs.com/en/3d-simulations/i-v-characteristics-of-solar-cell-I-physics-simulation>
4. <https://vlab.amrita.edu/?sub=2&brch=193&sim=575&cnt=1>
5. <https://jigyasa-csir.in/neeri/n32-t1-a2/>

CO-PO Mapping

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

JAD2211	FUNDAMENTALS OF DATA SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To understand the python libraries for data science
- To understand the concept of Exception Handling.
- To build the program to handle user-defined exceptions and raise custom exceptions.
- To perform various operations such as indexing, slicing, and mathematical computations.
- To present and interpret data using Packages in Python.

LIST OF PROGRAMS:

Implement the following programs

1. Python Program to compute the gcd of two numbers
2. Python Program for finding the maximum of a list of numbers
3. Python Program to insert a card in a list of sorted cards
4. Python Program for calculating the multiplication of two matrices
5. Python Program for word count using command line arguments
6. Python Program to find the most frequent words in a text read from a file
7. Python program for create a user defined exception
8. Download, install and explore the features of NumPy, and Pandas packages.
9. Working with Numpy arrays.
10. Working with Pandas data frames.

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Gain knowledge of different Python libraries commonly used in data science
- Able to utilize the Python libraries for data science task
- Build programs that handle user-defined exceptions
- Present and interpret data using packages in Python
- Gain practical experience in working with real-world datasets

TEXTBOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016
2. William Mckinney, —Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, O‘Reilly 2nd Edition

REFERENCES:

1. Gowrishanker and Veena, —Introduction to Python Programming, CRC Press 2019.
2. Eric Matthes —Python Crash Course, 2nd Edition- May 2019
3. Leo Chin and Tanmay Dutta, —NumPy Essentials, April 2016
4. Kenneth A. Lambert, (2011), —The Fundamentals of Python: First Programs, Cengage Learning

CO-PO Mapping

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

JMA2302	MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To equip students with the ability to deal with abstraction by teaching propositional logic.
- To familiarize students in combinatorial problems with applications.
- To outline the basics of graph theory and algorithms.
- To explain concepts of number theory and its applications.
- To conceptualize congruence, its applications and standard classical theorems.

UNIT I LOGIC

9 + 3

Propositional logic – Propositional equivalences – Normal forms – Predicates and quantifiers – Rules of inference.

UNIT II COMBINATORICS

9 + 3

Mathematical induction – Pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations using Generating functions – Inclusion and exclusion principle.

UNIT III GRAPHS

9 + 3

Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton graphs.

UNIT IV DIVISIBILITY THEORY AND CANONICAL DECOMPOSITION

9 + 3

Division algorithm – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM – Linear Diophantine equations.

UNIT V CONGRUENCES AND CLASSICAL THEOREM

9 + 3

Congruences – Linear Congruences – Modular exponentiation – Chinese remainder theorem (without proof) – Wilson's theorem (without proof) – Fermat's little theorem (without proof) – Euler's theorem (without proof) – Euler's Phi functions.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- Apply propositional logic in practical problems.
- Solve combinatorial problems using counting principle and mathematical induction.
- Demonstrate efficient use of graph theory in solving connectivity and shortest path problems.
- Apply divisibility theory and canonical decompositions in problems.
- Solve practical problems using classical theorems of number theory.

TEXT BOOKS:

1. Rosen K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.

2. Tremblay J.P. and Manohar R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1st Edition, 2017.
3. Koshy. T., "Elementary Number Theory with Applications", Elsevier Publications, New Delhi, 2nd Edition, 2007.

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1. Grimaldi R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Niven I, Zuckerman H.S. and Montgomery. H.L., "An Introduction to Theory of Numbers", John Wiley and Sons, Singapore, 2004

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4. <https://nptel.ac.in/courses/111101137/>
5. <https://nptel.ac.in/courses/111103020/>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	-	-	-	2	-	-	1	1	-	-
CO2	3	2	1	2	3	-	-	-	2	-	-	1	2	-	1
CO3	3	2	1	2	3	-	-	-	2	-	-	1	1	2	1
CO4	3	2	1	2	3	-	-	-	2	-	-	1	1	2	1
CO5	3	2	1	2	3	-	-	-	2	-	-	1	-	-	-

JAD2321	DATA ANALYTICS AND VISUALIZATION	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.

PREREQUISITE:

- Fundamentals of Data Science

UNIT I EXPLORATORY DATA ANALYSIS 9

Fundamentals – Understanding data science – Comparing DA with classical and Bayesian analysis – Software tools for DA - Visual Aids for DA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.

UNIT II VISUALIZING USING MATPLOTLIB 9

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

UNIT III UNIVARIATE ANALYSIS 9

Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

UNIT IV BIVARIATE ANALYSIS 9

Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations.

UNIT V MULTIVARIATE AND TIME SERIES ANALYSIS 9

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
3. Working with Numpy arrays, Pandas data frames , Basic plots using Matplotlib.

4. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse
7. Rollover effect, user interaction, etc..
8. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
9. Perform EDA on Wine Quality Data Set.
10. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of data analysis.
- Implement the data visualization using Matplotlib.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.
- Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016.
3. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008.

REFERENCES:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015.

WEB REFERENCES:

- <https://www.coursera.org/in/articles/what-is-data-analysis-with-examples>
- <https://www.geeksforgeeks.org/data-visualization-using-matplotlib/>
- <https://www.statisticshowto.com/univariate/>
- <https://byjus.com/maths/bivariate-analysis/>

JCS2301	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the concepts of ADTs.
- To design linear data structures – lists, stacks, and queues.
- To learn the non-linear data structure trees and its types.
- To understand the concepts of graphs and its applications.
- To understand sorting, searching, and hashing algorithms.

UNIT I ABSTRACT DATATYPE

9

Introduction to Data structures - Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists - Doubly-linked lists - Circularly linked lists – Applications - Polynomial Manipulation.

UNIT II LINEAR STRUCTURE

9

Stack ADT – Implementation - Array and Linked List – Applications - Queue ADT– Implementation – Array and Linked List – Applications- Infix to Postfix conversion - Evaluating arithmetic expressions.

UNIT III TREE STRUCTURE

9

Tree ADT – Terminologies- Tree traversals - Binary Tree ADT – Complete and Full Binary Tree - Expression trees- Binary search trees – AVL trees – Heaps – Priority Queue using Heap- B Tree.

UNIT IV GRAPH STRUCTURES

9

Graph ADT – Representations of graph – Types of graph - Graph traversals – Topological ordering – Applications - Shortest path: Dijkstra's algorithm – Minimum spanning trees: Prim's and Kruskal's algorithm.

UNIT V SORTING AND SEARCHING

9

Sorting: Bubble sort – selection sort – insertion sort – merge sort – quick sort – Searching: linear search – binary search – Hashing: hash functions – Separate Chaining, Open addressing- Rehashing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Explain abstract data types.

[illegible]

JIT2301	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the basic concepts of OOP and getting started with C++
- To study the properties and usage of inheritance and polymorphism in C++
- To understand file and exception handling and exploring on templates
- To learn the OOP principles of JAVA and creation of package
- To learn interface and thread concept. Also, to learn the design of an GUI based application using JavaFX

UNIT – I BASICS OF C++

9

Object Oriented Programming: Concepts of Object-Oriented Programming - Origins of C++ — Keywords - Classes and Objects – Constructors – Destructors – Static Data Members - Static Member Functions – Arrays Fundamentals – String Operations.

UNIT – II INHERITANCE AND POLYMORPHISM

9

Inheritance: Single, Multi-Level, Multiple, Hierarchical and Hybrid – Abstract Classes - Polymorphism- Function Overloading: Overloading Constructor Functions - Copy Constructors- Operator Overloading: Unary Operators – Binary operators.

UNIT – III FILES, TEMPLATES AND EXCEPTION HANDLING

9

Files: File Stream Operations - File Pointers Manipulation-Templates: Function templates – Class Templates – Exception handling: Try, Catch and Throw- Handling Derived-Class Exceptions - Exception Handling Options.

UNIT – IV FUNDAMENTALS OF JAVA AND PACKAGES

9

An Overview of JAVA: Three OOP Principles – Java Class – Simple Program - This Keyword - Finalize Method- Inheritance: Basics- Using Super- Method Overriding- Using Final- Packages: Defining Package – Access Protection - Importing Packages.

UNIT – V INTERFACES, THREADS AND GUI

9

Interfaces: Design and Implementation – Default Interface Methods - Thread Model: Creating a Thread – Synchronization – Interthread Communication – Multithreading - JavaFX: Basic Concepts – JavaFX Controls - Application Development.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Design a C++ programs with classes, objects and static member functions.
- Develop a C++ program using inheritance and polymorphism concept.
- Work with files and can handle exceptions. Also, design a program using template.
- Develop a simple Java Program and can create and import a package.
- Design an interface, synchronize various tasks and develop an GUI using JavaFX.

TEXT BOOKS:

1. Herbert Schildt, C++: The Complete Reference, 4th Edition, McGraw Hill Education, 2017.
2. Herbert Schildt, Java: The Complete Reference, 11th Edition, McGraw Hill Education, 2019.
3. J. F. DiMarzio, JavaFX A Beginners Guide, McGraw Hill Professional, 2011.

REFERENCES:

1. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, Addison-Wesley, 2013
2. E. Balagurusamy, Object Oriented Programming with C++, 8th Edition, McGraw Hill, 2020.
3. E. Balaguruswamy, Programming with JAVA - A Primer, Third Edition, McGraw-Hill Professionals, 2014.
4. R. Nageswara Rao and Kogent Solutions Inc., Core Java: An Integrated Approach, Dreamtech Press, 2008.

WEB REFERENCES:

1. [Java Tutorial - GeeksforGeeks](#)
2. [C++ Programming Language - GeeksforGeeks](#)
3. [C++ Tutorial | Learn C++ Programming Language - Scaler Topics](#)
4. [Java Tutorial | Learn Java Programming - Scaler Topics](#)
5. [Learn Java Programming \(programiz.com\)](#)
6. [JavaFX Tutorial \(tutorialspoint.com\)](#)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	-	-	-	-	-	-	-	1	1	3	1	3
CO2	3	3	3	-	-	-	-	-	-	-	1	1	3	1	3
CO3	3	3	3	-	-	-	-	-	-	-	1	1	3	1	3
CO4	3	3	3	-	-	-	-	-	-	-	1	1	3	1	3
CO5	3	3	3	-	-	-	-	-	-	-	1	1	3	1	3

JIT2321	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES

- To design digital circuits using simplified Boolean functions.
- To analyze and design combinational circuits.
- To understand the basic structure and operation of a digital computer.
- To study the design of the data path unit, and control unit for the processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems - Arithmetic Operations - Binary Codes - Boolean Algebra and Logic Gates - Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates.

UNIT II COMBINATIONAL LOGIC 9

Combinational Circuits - Binary Adder - Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoder - Encoder - Multiplexers - De-multiplexer.

UNIT III COMPUTER FUNDAMENTALS 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction types– Addressing Modes.

UNIT IV PROCESSOR 9

Instruction Execution – Building a Data Path – Designing a Control Unit – Pipelining – Data Hazard – Control Hazards.

UNIT V MEMORY AND I/O 9

Memory Concepts and Hierarchy – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder circuits
4. Implementation of 4-bit binary Subtractor circuits.
5. Implementation of code converters.
6. Implementation of BCD adder.
7. Implementation of encoder and decoder circuits.
8. Implementation of functions using Multiplexers

9. Implementation of functions using Demultiplexers.
10. Simulator based study of Computer Architecture.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Simplify Boolean functions using KMap.
- Design combinational circuits and analyze the design procedures.
- State the fundamentals of computer systems and analyze the execution of an instruction.
- Analyze different types of control design and identify hazards.
- Identify the characteristics of various memory systems and I/O communication.

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, “Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Sixth Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016.
3. M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016.

WEB REFERENCES:

1. <https://www.geeksforgeeks.org/difference-between-multiplexer-and-demultiplexer/>
2. <https://www.geeksforgeeks.org/introduction-of-sequential-circuits/>
3. <https://www.geeksforgeeks.org/microarchitecture-and-instruction-set-architecture/>
4. NPTEL :: Com <https://archive.nptel.ac.in/courses/106/105/106105163/>
5. Difference bet <https://www.geeksforgeeks.org/difference-between-serial-port-and-parallel-ports/>

CO-PO MAPPING:

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

JPT2041	SOFT SKILLS AND APTITUDE	L	T	P	C
		0	0	2	*

COURSE OBJECTIVES

- To make students analyze and solve problems in technical as well as aptitude. Enhance the technical skills and basics of programming language
- To make the students understand how to apply the practical knowledge with real time applications.
- To make the students think and draw a conclusion from different scenarios.
- To help the students understand C programming concepts

UNIT-I SOFT SKILLS AND APTITUDE - I

6

Synonyms - Antonyms - Odd Words - Idioms and Phrases - Error Spotting - Interpersonal Communication- Sentence Correction - Resume Writing Skills - Interview Skills.

UNIT-II SOFT SKILLS AND APTITUDE-II

6

Reading Comprehension - Sentence Improvement - Jumbled Sentences - Parts of speech - Fact, Inference, Judgements - . Paragraph formation -Fill in the Blanks - Group Discussion - Mock Interview Sessions.

UNIT III QUANTITATIVE APTITUDE

6

Number Theory - Divisibility rule - LCM and HCF - Simplification - Surds and Indices - Average – Percentage.

UNIT IV LOGICAL REASONING

6

Number and letter Series - Coding and Decoding - Ranking and Ordering - Odd man out - Image Based Relationships.

UNIT V TECHNICAL APTITUDE IN C-I

6

Pointers - Pointer dereferencing - Functions - Call by value, Call by reference - Structures - Structure Pointers - Arrays - One Dimensional, Two Dimensional, Multi-Dimensional - Sorting - Time Complexity - Strings - String Methods

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Develop different types of content using the skills learnt.
- Manage time and stress competently.
- Find answers to real time application problems.
- Use Logical reasoning skills to solve problems differently.
- Apply C programming concepts for coding.

TEXTBOOKS:

1. Dr.RS Aggarwal, "Quantitative Aptitude", S Chand Publishing, 2020.
2. Dr.R.S Aggarwal. "A Modern Approach To Verbal Reasoning",S. Chand Publishing, 2017.
3. Dr. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning". S. Chand Publishing, 2017.
4. Pradip Dey, ManasGhosh, "Fundamentals of Computing and Programming in C", First edition.

REFERENCES:

1. Data Communications and Networks- 2nd edition -Achyut S Godbole- and AtulKahate Tata McGraw-Hill, 2017.
2. Computer Networking - James F. Kurose & Keith W. Ross- PEARSON, 6th EDITION, 2017.
3. Computer Communications and Networking Technologies - Michael A. Gallo & William M. Hancock - BROOKS & COLE, 2001.

WEB REFERENCES:

- [https://www.indiabix.com/aptitude questions-and-answers](https://www.indiabix.com/aptitude%20questions-and-answers)
- <https://m4maths.com/placement-puzzles.php>
- www.freshersworld.com

JAL2311	DATA SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To understand the python libraries for data science
- To understand the basic Statistical and Probability measures for data science.
- To learn descriptive analytics on the benchmark data sets.
- To apply correlation and regression analytics on standard data sets.
- To present and interpret data using visualization packages in Python.

LIST OF PROGRAMS

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays.
3. Working with Pandas data frames.
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
 - a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
 - b. Bivariate analysis: Linear and logistic regression modeling.
 - c. Multiple Regression analysis
 - d. Also compare the results of the above analysis for the two data sets.
6. Basic plots using Matplotlib.
7. Apply and explore various plotting functions on UCI data sets.
 - a. Normal curves
 - b. Density and contour plots
 - c. Correlation and scatter plots
 - d. Histograms
 - e. Three dimensional plotting
8. Visualizing Geographic Data with Basemap.

TOTAL: 60 PERIODS

COURSE OUTCOMES

- Make use of the python libraries for data science
- Make use of the basic Statistical and Probability measures for data science.
- Perform descriptive analytics on the benchmark data sets.
- Perform correlation and regression analytics on standard data sets
- Present and interpret data using visualization packages in Python.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE

Stand-alone desktops 30 Nos. (or) Server supporting 30 terminals or more.

SOFTWARE

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Note: Example data sets like: UCI, Iris, Pima Indians Diabetes etc.

WEB REFERENCES:

- <https://www.simplilearn.com/introduction-to-data-science-with-python-article>
- https://www.tutorialspoint.com/python_data_science/index.htm
- <https://www.datacamp.com/tutorial/matplotlib-tutorial-python>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	1	3	3	3	2	2	1
CO2	3	2	2	3	1	-	-	-	3	1	3	2	2	2	1
CO3	3	2	1	3	1	-	-	-	2	1	1	1	2	1	-
CO4	2	3	1	3	-	-	-	-	2	3	2	3	2	2	-
CO5	1	2	3	1	1	-	-	-	2	1	3	1	3	2	1
AVG	2	2	2	2	1	-	-	-	2	2	2	2	2	2	1

JIT2311	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To understand basics of Object-Oriented Programming with C++ and Java programming language.
- To know the principles of polymorphism and templates.
- To define exceptions and use of inheritance.
- To develop a java application with threads and interfaces.
- To design and build Graphical User Interface Application using JAVA FX.

LIST OF PROGRAMS

Implement the following programs

1. a) Develop a C++ code to create a class and object and print the member variables.
b) Develop a C++ program to show the working of default constructor, parametrized constructor and copy constructor and destruct any object.
2. Implement a C++ code to demonstrate the concept of static member function.
3. Develop a menu driven C++ program to find area of two-dimensional objects (any three) using function overloading.
4. (a) Develop a C++ code to overload the unary operators using operator function.
(b) Develop a C++ code to overload binary operators using operator function.
5. (a) Implement a C++ code to swap any two values using function template.
(b) Implement a C++ code to find the maximum of any three values using a class template.
6. Develop a C++ code to handle division-by-zero and out-of-range exception.
7. (a) Implement a Java code to print the sum, multiply, subtract, divide and remainder of two numbers. Get the input from the user.
(b) Develop a Java program to print and return the current class instance using this keyword.
8. Develop an application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
9. Develop a Java program to create a 'Geometry' package with relevant classes (For e.g. Circle/ Square/ Polygon and so on.) and export it.
10. Create an interface for 'Playable' with classes Football, Volleyball and Basketball.
11. Develop a Java code to implement the concept of thread.

12. Design and develop an application using JavaFX.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the lab course, the student should be able to:

- Apply the concepts of classes and objects to solve simple problems.
- Develop programs using polymorphism and templates.
- Handle the exceptions and inherit a class.
- Build Java applications with thread models and interfaces.
- Develop GUI based applications in JavaFX using event handling concept and controls.

TEXT BOOKS:

1. Herbert Schildt, "C++: The Complete Reference", 4th Edition, McGraw Hill Education, New Delhi, 2017.
2. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019.
3. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015.

WEBSITE REFERENCES:

1. C++ Programming | Neso Academy
4. cplusplus.com/doc/tutorial/
5. C++ Tutorial (w3schools.com)
6. Introduction to Java (w3schools.com)
7. Java Tutorials for Beginners (tutorialspoint.com)

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: Stand-alone desktops 30 Nos. (or) Server supporting 30 terminals or more

SOFTWARE: Windows / Linux operating system, C++ compiler, JDK 1.8 (or above)

CO-PO MAPPING:

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

SEMESTER IV

JMA2402	APPLIED LINEAR ALGEBRA	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To impart knowledge of consistency of system of equations through Rouché-Capelli theorem.
- To familiarize students in the concepts of vector spaces, bases and dimension.
- To enable students understand concepts of linear transformation, Eigenvalues, Eigenvectors and Diagonalizability.
- To introduce inner product spaces, orthogonalization and least square approximations.

UNIT I MATRICES AND SYSTEM OF LINEAR EQUATIONS

9 + 3

Matrices – Row Echelon form – Rank – Non-homogeneous system of linear equations – Homogeneous system of linear equations – Rouché-Capelli theorem (without proof) – Consistency – Gauss Jordan method – Gauss Seidel method.

UNIT II VECTOR SPACES

9 + 3

Definition of field – Vector spaces – Subspaces – Properties – Linear combinations – Linear independence and linear dependence – Span – Bases and dimensions.

UNIT III LINEAR TRANSFORMATION

9 + 3

Linear transformation – Properties – Kernel and Range – One-to-One correspondence – Rank and Nullity – Dimension theorem.

UNIT IV DIAGONALIZATION

9 + 3

Matrix representations of linear transformations – Eigenvalues and eigenvectors – Diagonalizability.

UNIT V INNER PRODUCT SPACES

9 + 3

Inner products and norms – Gram Schmidt orthogonalization process – Least square approximation.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Apply Rouché-Capelli theorem for solving system of equations.
- Solve problems occurring in vector spaces and subspaces.
- Conceptualize linear transformation and use it in real-time problems.
- Demonstrate efficient use of matrix representations and diagonalization.
- Solve problems using orthogonalization process and use least square approximations.

TEXT BOOKS:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2021.
2. Kreyszig Erwin., "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3. Friedberg. A.H., Insel. A.J. and Spence. L., “Linear Algebra”, Prentice Hall of India, New Delhi, 2004

REFERENCES:

1. Kumaresan. S., “Linear Algebra – A Geometric Approach”, Prentice – Hall of India, New Delhi, Reprint, 2010.
2. 4. Lay D.C., “Linear Algebra and its Applications”, 5th Edition, Pearson Education, 2015.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/111107105/>
2. <https://nptel.ac.in/courses/108104174/>
3. <https://nptel.ac.in/courses/111104137/>
4. <https://nptel.ac.in/courses/111106135/>
5. <https://nptel.ac.in/courses/111108157/>

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2
CO2	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2
CO3	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2
CO4	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2
CO5	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2

JAL2401	PRINCIPLES OF ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enable students understand the various characteristics of a problem solving agents.
- To explain about the different searching strategies involved in problem solving.
- To describe about solving problems with various constraints.
- To specify the representation of knowledge and reasoning
- To outline the various applications of Artificial Intelligence.

UNIT-I INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND AGENTS 9

Introduction - The Foundations of Artificial Intelligence - The History of Artificial Intelligence - The State of the Art - Risks and Benefits of AI - Intelligent Agents - Agents and Environments - Good Behavior: The Concept of Rationality - The Nature of Environments - The Structure of Agents.

UNIT-II PROBLEM SOLVING AND SEARCHING 9

Solving problems by searching - Problem-Solving agents - Example problems - Search algorithms - Uninformed search strategies - Informed (Heuristic) search strategies - Heuristic functions - Search in complex environments - Local search and optimization problems - Local search in continuous spaces - Search with nondeterministic actions - Search in partially observable environments - Online search agents and unknown environments.

UNIT-III CONSTRAINT SATISFACTION PROBLEMS AND GAME THEORY 9

Constraint satisfaction problems - Defining constraint satisfaction problems - Constraint propagation: inference in CSPs - Backtracking search for CSPs - Local search for CSPs - Structure of problems - Adversarial search and games - Game theory - Optimal decisions in games - Heuristic Alpha-Beta tree search - Monte Carlo tree search - Stochastic games - Partially observable games - Limitations of game search algorithms.

UNIT-IV KNOWLEDGE AND REASONING 9

First-Order Logic – Knowledge Representation - Syntax and Semantics of First-Order Logic - Using First-Order Logic - Knowledge Engineering in First-Order Logic - Inference in First-Order Logic - Propositional vs. First-Order Inference - Unification and First-Order Inference - Forward Chaining - Backward Chaining - Quantifying Uncertainty - Bayes' Rule and Its Use - Naive Bayes Model.

UNIT-V EXPERT SYSTEMS AND APPLICATIONS OF ARTIFICIAL INTELLIGENCE 9

Expert systems - Architecture of expert systems - Roles of expert systems - MYCIN - DART - XOON - Application Domains Of AI - Artificial Intelligence in Environmental Management - Artificial Intelligence in Systems Biology: Opportunities in Agriculture, Biomedicine, and Healthcare - Artificial Intelligence in Disease Diagnosis via Smartphone Applications.

TOTAL: 45 PERIODS

COURSE OUTCOME:

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

- Understand the various characteristics of a problem solving agents.
- Explain about the different searching strategies involved in problem solving.
- Describe about solving problems with various constraints.
- Assess the representation of knowledge and reasoning.
- Develop applications using Artificial Intelligence.

TEXT BOOKS:

1. Stuart J. Russell, Peter Norvig, “Artificial Intelligence - A Modern Approach”, 4th Edition, Pearson Publishers, 2022.
2. Kaliraj, P., & Devi T, “Artificial Intelligence Theory, Models, and Applications”, 1st edition, CRC Press, Taylor & Francis Group, Boca Raton, Auerbach Publications.

REFERENCES:

1. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill Education, 2008.
2. Dan W. Patterson - Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.
3. Nilsson, Artificial Intelligence: A New Synthesis (1 ed.), Morgan-Kaufmann, 1998. ISBN 978-1558605350.
4. Dheepak Khemani, “A first course in Artificial Intelligence”, McGraw Hill Education Pvt. Ltd., NewDelhi, 2013.
5. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O’Reilly, 2009, <https://www.nltk.org/book/>.
6. Saroj Kaushik, Logic & Prolog Programming, New Age International, 1st edition, 2002.
7. Expert Systems: Principles and Programming, 11 March 1998. Edition: 4th. ISBN: 9788131501672.

WEB LINKS:

1. <http://nptel.ac.in/courses/106105079/2>
2. <https://cloudsek.com/blog/intelligent-searching-techniques-in-artificial-intelligence>
3. <https://www.aiforanyone.org/glossary/first-order-logic>
4. <https://www.javatpoint.com/knowledge-representation-in-ai>
5. <https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP>
6. <https://www.guru99.com/expert-systems-with-applications.html>

CO-PO MAPPING:

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

JCS2401	DATABASE MANAGEMENT SYSTEM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the working of various data models and get exposed to SQL querying.
- To design data base with ER models and understand the significance of normalization.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques.
- To familiarize the students with different types of advanced databases.

UNIT I DATA MODELS AND QUERYING 9

Purpose of Data base System–Views of data–Data Models–Data base System Architecture
Introduction to relational databases–Relational Model–Keys–Relational Algebra–SQL fundamentals–
Advanced SQL features–Embedded SQL–Dynamic SQL.

UNIT II DESIGN AND NORMALIZATION 9

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping
Functional Dependencies–Non-loss Decomposition–First-Second-Third Normal Forms Dependency
Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form–
Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION PROCESSING 9

Transaction Concepts–ACID Properties– Schedules–Serializability–Concurrency Control– Need for
Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery–
SavePoints –Isolation Levels–SQL Facilities for Concurrency and Recovery.

UNIT IV DATA ORGANIZATION AND QUERY OPTIMIZATION 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing Ordered Indices
– B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing
Overview–Query optimization.

UNIT V ADVANCED DATABASES 9

OODBMS- - Object-Based Databases - OO Data Model - OO Languages – Object Relational
Databases - ODMG Object Model - XML – Structure of XML - Temporal Databases – Mobile
Databases – Spatial Databases.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Design efficient databases and extract information with SQL queries
- Develop preliminary design of normalized databases
- Analyze the various transactions and provide smooth access of data
- Create organized databases and write optimized queries
- Apply the various advanced database concepts and security to the current project.

TEXTBOOKS:

1. Abraham Silberschatz, HenryF. Korth, S.Sudharshan, “Database System Concepts”, Seventh Edition, TataMcGraw Hill,2020
2. Ramez Elmasri, Shamkant B.Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2017.

REFERENCES:

1. Raghu Ramakrishnan, Johannes Gehrke , “Database Management Systems”, Third Edition, McGraw-Hill College Publications, 2015.
3. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2008.
4. G.K.Gupta, “Database Management Systems” ,Tata McGrawHill, 2011.

WEBSITE REFERENCES:

- <https://www.tutorialspoint.com/dbms/index.htm>
- <https://www.mygreatlearning.com/academy/learn-for-free/courses/database-management-systems-dbms>
- <https://www.w3schools.in/dbms/>
- https://sqlzoo.net/wiki/SQL_Tutorial

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	3	1	3	2	3			
CO2	3	3	3	2	3	3	1	3	2	3	2	3			
CO3	3	3	3	2	3	3	2	3	2	3	2	3			
CO4	3	3	3	1	3	3	2	3	2	3	2	3			
CO5	3	3	3	2	3	3	2	3	1	3	2	3			
AVG	3	3	3	1.8	3	3	1.8	3	1.6	3	2	3			

LIST OF EXPERIMENTS:

1. Basics of UNIX commands
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, open dir, read dir
3. Write C programs to simulate UNIX commands like cp, ls, grep, etc.
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Bankers Algorithm for Dead lock Avoidance
6. Implementation of Dead lock Detection Algorithm
7. Implementation of the following Memory Allocation Methods for fixed partitiona)FirstFit b)WorstFit c)BestFit
8. Implementation of Paging Technique of Memory Management
9. Implementation of the following Page Replacement Algorithmsa)FIFO b)LRUc)LFU

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- ☐ Classify operating system components and system calls based on functionality
- ☐ Analyze and evaluate CPU scheduling algorithms and assess the solutions for synchronization problems and dead lock prevention
- ☐ Familiarize in memory management and storage management techniques
- ☐ Analyze the File System Interface, Directory Structure
- ☐ Compare iOS and Android Operating Systems.

TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2018.
2. William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall, 2018.

REFERENCES

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley, 2014.
2. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education, 2018.
3. D M Dhamdhere, “Operating Systems: A Concept-Based Approach”, Second Edition, Tata McGraw Hill Education.

WEBSITE LINKS

1. https://www.tutorialspoint.com/operating_system/os_overview.htm/
2. <https://www.geeksforgeeks.org/introduction-of-process-management/>
3. <https://technobyte.org/memory-management-os-simple-explanation/>
4. <https://inst.eecs.berkeley.edu/~eecsba1/sp97/reports/eecsba1a/index-os.html/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	2	-	-	3	3	3	3
CO2	3	3	3	3	-	-	-	-	2	-	-	3	3	3	3
CO3	3	3	3	3	-	-	-	-	2	-	-	3	3	3	3
CO4	3	3	3	3	-	-	-	-	2	-	-	3	3	3	3
CO5	3	3	3	3	3	2	-	-	2	-	-	3	3	3	3
AVG	3	3	3	3	0.6	0.4	-	-	2	-	-	3	3	3	3

JAL2411	PRINCIPLES OF ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To provide students with a theoretical and practical base in Artificial Intelligence.
- Students will be able to design, implement, and analyse simple problem solving technique.
- Students will be able to identify, formulate, and solve problems.

LIST OF EXERCISES

1. Study of Prolog.
2. Simple facts and rules for simple statements using PROLOG.
3. PROLOG programs for the following:
 - a. To convert centigrade temperatures to Fahrenheit and to check if a temperature is below freezing level.
 - b. For medical diagnosis and show the advantage and disadvantage of green and red cuts.
4. Solving water jug problem.
5. Implementation of depth first search and breadth first search.
6. Implementation of A* search algorithm.
7. Solving 8-Queens problem.
8. Solving traveling salesman problem.
9. Implementation of minimax search algorithm.
10. Implementation of backward chaining and forward chaining.
11. Implementation of tic-tac-toe game.
12. Application development for any of the following areas:
 - a. Healthcare
 - b. Agriculture
 - c. Weather forecasting
 - d. Sales prediction

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Understand the major areas and challenges of AI.
- Apply basic AI algorithms to solve problems.
- Develop programming solutions for given problem scenario.
- Describe search strategies and solve problems by applying a suitable search method.
- Solve the given problem scenario.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

HARDWARE: Standalone desktops 30 Nos. (or) Server supporting 30 terminals or more.

SOFTWARE: LISP / PROLOG, Java / Python

WEB REFERENCES:

1. <https://www.tutorialspoint.com/lisp/index.htm>
2. <https://www.swi-prolog.org/>
3. <https://www.tutorialspoint.com/prolog/>
4. <https://www.javatpoint.com/java-tutorial>

CO-PO MAPPING:

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

JCS2411	DATABASE MANAGEMENT SYSTEM LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To familiarize with DDL, DML and DCL Commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of databases
- To be familiar with database triggers for specific application
- To develop applications using front-end tools and back-end DBMS

PREREQUISITE:

- Basics of Programming Concepts

LIST OF EXPERIMENTS

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Creation of Views, Sequences, Indexes, Save point and commit constraints.
4. Database Programming: Implicit and Explicit Cursors with PL/SQL block.
5. Creation of PL/SQL Procedures and Functions.
6. Creation of PL/SQL Triggers.
7. Exception Handling.
8. Database Design using ER modelling, Normalization and Implementation for any application.
9. Database Connectivity with Front End Tools
10. Mini project (Application Development) in one of the following systems:
 - a) Student database system
 - b) Inventory Control System
 - c) Online Library Management
 - d) Hospital Management System
 - e) Railway Reservation System
 - f) Personal Information System
 - g) Online Course registration and maintenance System
 - h) Attendance Management System
 - i) Hotel Management System
 - j) E-commerce portal
 - k) Online auction system

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Execute typical data definitions, data control and data manipulation commands
- Familiarize with Nested and Join Queries for extracting combinatorial data
- Implement simple applications that use Views

- Develop PL/SQL procedures, functions and packages
- Develop applications using Front-end & Back-end Tools and also to handle report generation.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

HARDWARE: Standalone desktops 30 Nos. (or) Server supporting 30 terminals or more.

SOFTWARE:

REFERENCE BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, Tata McGraw Hill, 2020.

WEB REFERENCES:

- <https://www.w3schools.com/sql/default.asp>
- https://www.tutorialspoint.com/dbms/er_diagram_representation.html
- https://www.tutorialspoint.com/python/python_database_access.html
- <https://sqlzoo.net>

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	1	2	3	2	2	2	3	2	3	3	2	2			
CO2	1	2	3	2	2	1	3	1	2	2	2	2			
CO3	2	2	3	3	2	3	3	2	1	3	3	2			
CO4	3	2	3	3	1	1	3	1	3	2	3	3			
CO5	3	2	3	1	3	2	3	2	2	3	3	3			
AVG	2	2	3	2.2	2	1.8	3	1.6	2.2	2.6	2.6	2.4			

JPT2041	SOFT SKILLS AND APTITUDE	L	T	P	C
		0	0	2	1

OBJECTIVES:

1. To help students learn various forms of writing and develop content
2. To help students acquire time and stress management skills
3. To facilitate students to gain required knowledge to understand practical concepts in aptitude
4. To develop the thinking and analytical skills of students
5. To gain knowledge in concepts of C programming language

UNIT - I SOFT SKILLS AND APTITUDE-III 5

Communication – on Specific topics – both oral and written – Content development – various forms of writing and specific writing – Brainstorming – Individual – Concept focusing – Public Speaking – Analytical writing.

UNIT - II SOFT SKILLS AND APTITUDE-IV 5

Importance of Time – Time Management techniques – The art of prioritizing and scheduling – Stress – Positive and Negative Stress - Stress Management techniques – SWOT Analysis

UNIT III QUANTITATIVE APTITUDE 6

Profit and Loss and Discount – Simple and Compound interest - Ratio and Proportions – Allegations and Mixtures – Problem on Ages

UNIT IV LOGICAL REASONING 6

Directions – Blood Relation – Linear and Circular Arrangement – Cross variables – Set Theory

UNIT V TECHNICAL APTITUDE IN C-II

Strings - Storage Classes – Pointers – Preprocessor directives - Structures – Union. Type def – Input/Output – File I/O - Header Files – Type casting – Error handling – Command Line Arguments – Variable Arguments – Memory Management - Bitwise operators

COURSE OUTCOMES

At the end of the course, the student will be able to

- Develop different types of content using the skills learnt

- Manage time and stress competently
- Find answers to real time application problems
- Use Logical reasoning skills to solve problems differently
- Apply C programming concepts for coding

TEXT BOOKS:

- 1.Dr. R.S Agrawal, “Quantitative Aptitude” and Non Verbal Reasoning published in 2000.
- 2.S.Chand – A Modern Approach to Logical Reasoning Published in 2000.
- 3.Pradip Dey, ManasGhosh, "Fundamentals of Computing and Programming in C. First

WEBSITES:

<https://www.indiabix.com/aptitude/questions-and-answers/>

<https://m4maths.com/placement-puzzles.php>

[www.freshers](http://www.freshersworld.com) world.com

www.careerride.com

www.youtube.com/watch/python

[www.youtube.com/watch/concepts of python](http://www.youtube.com/watch/concepts%20of%20python)

<https://stackoverflow.com/>

<https://www.w3schools.com/>

<https://www.geeksforgeeks.org/>

JGE2442 Advanced IT Infrastructure Lab

Objective

- Equip students with a strong foundation in network design, implementation, and troubleshooting.
- Develop skills in managing servers and data storage in enterprise environments.
- Provide comprehensive knowledge and skills to secure IT infrastructure.
- Train students in deploying and managing virtualized environments and automating IT tasks.
- Prepare students for designing, implementing, and managing cloud infrastructure.

Module 1: Networking

Lab: Setting up a basic network, IP Address, VLAN and Routing Configurations

- Introduction to OSI and TCP/IP models, IP addressing.
- Subnetting and IP configuration exercises.
- Introduction to VLANs and Routing Protocols (OSPF, BGP).
- Network Performance tools and introduction to QoS.
- Fundamentals of SDN and network troubleshooting.

Module 2: Server and Storage

Lab: Hands-on installation of server operating systems, Server configuration exercises Including Setting up Storages.

- Server architectures and installation of server OS (Windows and Linux).
- Configuration and management of Windows and Linux servers.
- Introduction to Data Storage Technologies (DAS, NAS, SAN).
- Understanding RAID levels and implementation.
- Exploring advanced storage solutions (Storage virtualization and flash storage).

Module 3: Security

Lab: Configuring Firewalls, Penetration Techniques and Tools, Security Audit and Compliance Checks

- Basics of encryption, firewalls, and VPNs.
- Setting up and managing IDS/IPS.
- Ethical hacking basics and security auditing.
- Advanced security practices and compliance.
- Incident response and introduction to digital forensics.

Module 4: Virtualization & Automation

Lab: Creating Virtual Machines, Managing Containers, Ansible Playbook and CICD Pipelines Using Jenkin.

- Introduction to virtualization technologies and setting up VMs.
- Containerization with Docker and Kubernetes basics.
- Managing containers.

- Introduction to automation with Ansible and PowerShell.
- Implementing CI/CD pipelines and Infrastructure as Code.

Module 5: Cloud Computing

Labs: AWS or Azure Cloud – Services Deployment, AI and Machine Learnings on Cloud

- Cloud service models and initial setup in AWS, Azure, or Google Cloud.
- Cloud architecture and scalable systems design.
- Multi-cloud and hybrid cloud strategies.
- Serverless computing and cloud-native technologies.
- AI and machine learning integration in cloud environments.

SEMESTER V

JMA2501	OPTIMIZATION TECHNIQUES	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To enable students understand linear programming problems.
- To impart knowledge of duality in linear programming problems and build concepts in transportation and assignment problems.
- To outline various methods for solving non-linear programming problems.
- To introduce problem solving using dynamic programming and game theory.
- To familiarize students in Markovian and Non Markovian queue models

UNIT-I **LINEAR PROGRAMMING** **9+3**

Formulation – Types of Solutions of an LPP – Graphical solution – Simplex method – Big M method – Two phase method.

UNIT-II **ADVANCED LINEAR PROGRAMMING** **9+3**

Duality in linear programming problems – Dual Simplex method – Transportation and Assignment problems.

UNIT-III **NON-LINEAR PROGRAMMING** **9+3**

Lagrangian method – Kuhn-Tucker conditions – Wolfe's method – Beale's method.

UNIT-IV **DYNAMIC PROGRAMMING AND GAME THEORY** **9+3**

Bellman's principle of optimality – Forward and Backward recursion – Capital budgeting problem – Reliability improvement problem – Cargo loading problem.

Game Theory – Two person Zero sum games – Saddle point – Dominance Rule – Method of matrices – Graphical solution.

UNIT-V **QUEUEING MODELS** **9+3**

Markovian queues (without proof) – Single and multiple server, Infinite and finite queueing models – Little's formula.

Non-Markovian queues – M/G/1 queue – Pollaczek Khinchine formula (without proof) – M/D/1 model.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- Solve linear programming problems through simplex and other methods.
- Demonstrate efficient use of duality in linear programming problems and solve transportation and assignment problems.
- Solve non-linear programming problems through standard methods.
- Conceptualize dynamic programming and game theory and use it in real-time problems.
- Apply Little's formula for finding standard parameters of Markovian and Non Markovian queue problems.

TEXT BOOKS:

1. Paneerselvam R., “Operations Research”, Prentice Hall of India, Fourth Print, 2016.
2. Hamdy A Taha “Introduction to Operations Research”, Prentice Hall India, 10th Edition, 2019.
3. Gross D., and Harris C.M., ”Fundamentals of Queueing Theory”, Wiley Student 4th Edition, 2014.

REFERENCES:

1. G. Srinivasan., “Operations Research – Principles and Applications”, 2nd Edition, PHI, 2010.
2. Bernard. W. Taylor., “Introduction to Management Science”, Pearson Publications, 12th Edition, 2016.

WEB REFERENCES:

- <https://nptel.ac.in/courses/111104027/>
- <https://nptel.ac.in/courses/110105082/>
- <https://nptel.ac.in/courses/111105100/>
- <https://nptel.ac.in/courses/110101133/>
- <https://nptel.ac.in/courses/111103159/>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2
CO2	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2
CO3	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2
CO4	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2
CO5	3	2	2	2	3	-	-	-	2	-	-	1	2	2	2

JAL2501	MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To familiarize the basic concepts of machine learning.
- To enable building supervised learning models.
- To enable building unsupervised learning models.
- To inculcate knowledge on neural networks.
- To evaluate the machine learning algorithms.

UNIT I INTRODUCTION TO MACHINE LEARNING

9

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

UNIT II SUPERVISED LEARNING

9

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, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING

9

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

9

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

9

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.

TOTAL 45 PERIODS

COURSE OUTCOMES

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

- Explain the basic concepts of machine learning.
- Construct supervised learning models.
- Construct unsupervised learning algorithms.
- Apply neural networks to make intelligent decisions
- Evaluate and analyze machine learning algorithms.

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, 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.

WEBSITE REFERENCES

1. <https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained>
2. <https://www.simplilearn.com/tutorials/machine-learning-tutorial/supervised-and-unsupervised-learning>
3. <https://www.investopedia.com/terms/n/neuralnetwork.asp>
4. <https://towardsdatascience.com/a-quick-guide-to-managing-machine-learning-experiments-af84da6b060b>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	-	-	-	-	-	-	1	2	2	2
CO2	3	2	3	2	3	-	-	-	-	-	-	1	2	2	2
CO3	3	3	3	3	3	-	-	-	1	-	1	2	2	2	2
CO4	3	3	3	2	3	-	-	-	1	-	1	2	2	2	2
CO5	3	3	3	3	3	-	-	-	3	3	1	1	2	2	2

JCS2501	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basic concepts of layered approach in Computer Networks and different transmission media of physical layer.
- To know functions of Data link layer and Media access layer.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of Transport layer.
- To familiarize the application layer services.

Prerequisite : Digital Principles and Computer Organization

UNIT-I INTRODUCTION AND PHYSICAL LAYER 9

Building a network-Layered Network Protocol Architectures- Telecommunications and Cellular Networks overview- Design issues- OSI Model- TCP/IP protocol suite- Physical layer-Basics of communications- Transmission Media-Performance.

UNIT-II DATA-LINK LAYER & MEDIA ACCESS 9

Link layer Services - Framing - Error control - Flow control - Media access control (TDMA, FDMA, CSMA, CSMA/CD)- Ethernet IEEE 802.3 - Wireless LAN IEEE 802.11 -Bluetooth -Performance analysis: related protocols such as ICMP, NAT, ARP and RARP.

UNIT-III NETWORK LAYER 9

Network layer – Hierarchical network architecture-IPv4 and IPv6 addressing- Routing protocols: Distance-vector and Link-state approaches (RIP, OSPF, BGP) – Multicast Addressing– Multicast routing protocols (DVMRP, PIM).

UNIT-IV TRANSPORT LAYER 9

Overview of Transport layer-Reliable end- to- end transmission protocols- UDP, TCP- Connection management-Flow control- Retransmission-TCP Congestion control-Congestion avoidance(DEC bit, RED)-QoS.

UNIT-V APPLICATION LAYER 9

Socket Interface and Socket programming, Example protocols: DNS, SMTP, FTP, HTTP-Electronic Mail (POP3, IMAP, MIME)-HTTP-web services

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- Evaluate the functions and performance of a network
- Comprehend the data f

- low and control between nodes in the network
- Analyze and design routing algorithms
- Familiarize with the functionalities of various protocols and congestion mechanism in network
- Familiarize with different application layer protocols

TEXT BOOKS:

1. Behrouz A. Forouzan, “Data Communications and Networking”, Fifth Edition TMH, 2017.
2. LarryL. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kauffmann Publishers Inc., 2012.

REFERENCES:

1. James F.Kurose, Keith W.Ross, “Computer Networking: A Top-Down Approach”, Seventh Edition, Pearson Education, 2017
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-DarLin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5. Andrew S. Tanenbaum, David Wetherall, “Computer Networks”, Fifth Edition, Pearson Education, 2013

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2. <https://www.tutorialspoint.com/medium-access-control-sublayer-mac-sublayer>
3. <https://www.cse.iitk.ac.in/users/dheeraj/cs425/lec12.html>
4. <https://www.gatevidyalay.com/tcp-congestion-control-tcp-protocol-tcp/>
5. <https://w3.cs.jmu.edu/kirkpams/OpenCSF/Books/csf/html/Sockets.html>

CO-PO MAPPING:

[illegible]

JIT2501	Web Applications Framework	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand and practice Embedded Dynamic Client-side Scripting.
- To understand Server-side Programming Language.
- To study about PHP programming.
- To learn about JQuery.
- To learn basic architecture of Angular and React JS.

UNIT-I WWW and JAVASCRIPT

9

WWW: Internet technologies Overview – Internet Standards & Protocols - HTTP.
JAVASCRIPT: Introduction to Scripting - Data types and Variables - Operators, Expressions and Statements - Functions - Arrays - Objects - Document Object Model - Event Handling – JSON.

UNIT-II SERVLETS

9

Servlets: Java Servlet Architecture - Servlet Life Cycle - Form GET and POST actions- Session Handling - Understanding Cookies - Database Connectivity - JDBC.

UNIT-III PHP

9

PHP: Variables – Conditions, Branches, Loops - Arrays & Strings - Regular Expressions - Date and Time Functions - Integer and Float Functions - User-Defined Functions - Program control - Form Processing - Cookies – Database Connectivity.

UNIT-IV JQUERY

JQUERY: Introduction to jQuery – Selectors – Elements: Manipulations, Changing and Setting elements – Event Models: Event handlers – Animations & Effects – Functions – Plugins.

UNIT-V ANGULAR and REACTJS

9

ANGULAR: Introduction – Setup with Node.js & Angular CLI – Components – Data Binding – Directives (*ngIf, *ngFor).Pipes (uppercase, date) – Event Handling – Template Forms – Simple Services – Build Basic UI.REACTJS: Introduction – Features – JSX Syntax – Functional Components – Props and State.Event Handling – Simple Forms – Routing Basics – Data Display in Table – CSS Styling & Animation.

TOTAL: 45 PERIODS

COURSE OUTCOME

Upon completion of the course, the students will be able to:

- Design and implement dynamic web pages with validation and event handling by applying JavaScript.
- Design and implement Server-side Programming using Servlet.
- Design and implement Server-side Programming using PHP.

- Design and implement client-side webpage using jQuery.
- Learn and design web applications using Angular and ReactJS.

TEXT BOOKS

1. Paul Deitel, Harvey Deitel, Abbey Deitel, “Internet and World Wide Web - How To Program”, Fifth Edition, Pearson Education, 2011.
2. Nate Murray, Felipe Coury, Ari Lerner, and Carlos, “ng-book The Complete Guide to Angular”, Fullstack.io, 2020.
3. Adam Freeman, Pro React 16, Apress, 2019.

REFERENCES

1. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.
2. Bear Bibeault and Yehuda Katz, “jQuery in Action”, 2008.
3. Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011.
4. UttamK.Roy, “Web Technologies”, Oxford University Press, 2011.
5. Nln Lnc, Susan Fitzgerald, “React js: Hands-On full stack web development using React js”, 2nd Edition, 2020.

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1. <https://www.w3schools.com/js/default.asp>
2. <https://www.tutorialspoint.com/servlets/index.htm>
3. <https://www.w3schools.com/php/default.asp>
4. <https://www.w3schools.com/jquery/default.asp>
5. <https://www.youtube.com/watch?v=ggvMyaM0R5w>

Mapping of CO with PO/PSO

CO/ PO	PROGRAM OUTCOME												PSO	
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	3	-	-	-	-	2	-	2	3	3
CO2	3	3	3	2	3	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	3
CO4	3	2	3	2	3	-	-	-	-	2	-	2	3	3
CO5	3	3	3	3	3	-	-	-	-	2	-	2	3	3

JPT2042	TECHNICAL SKILLS AND APTITUDE	L	T	P	C
		0	0	2	*

COURSE OBJECTIVES:

- To make students analyze and solve problem in technical as well as aptitude. Enhance the Technical skills and basics of programming language.
- To make the students understand how to apply the practical knowledge with real time applications.
- To make the students think and draw a conclusion from different scenarios.
- To help the students understand OOPS and python programming concepts.
- To help the students understand concepts and problems in OOPS and python.

UNIT – 1: FUNDAMENTALS OF C++

6

Introduction to C++ - Data Types and Operators - Control Structures - Functions in C++ - Arrays and Strings - Structures and Unions - File Handling.

UNIT – 2: OBJECT-ORIENTED PROGRAMMING (OOP) & ADVANCED C++

6

Object-Oriented Programming (OOP) - Inheritance & Polymorphism - Operator Overloading - Templates and Exception Handling - Standard Template Library (STL) - Multi-threading & advanced topics.

UNIT- 3: PYTHON BASICS & FUNDAMENTALS

6

Introduction to Python - Data Types & Variables - Operators & Expressions - Control Flow Statements - Functions & Modules - File Handling - Exception Handling.

UNIT- IV: QUANTITATIVE APTITUDE

6

Time and work – Pipes and Cistern – Time and Distance – Problems on Trains – Boats and streams – Arithmetic and Geometric progression.

UNIT - V: LOGICAL REASONING

6

Syllogism: Statement and Conclusion – Clocks - Inequalities – Non Verbal Reasoning – Logical Sequence, Inferred Meaning

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

CO1: To enhance their knowledge in OOPS concepts

CO2: To enhance knowledge in PYTHON programming

CO3: To gain knowledge in Coding the concepts of python programming.

CO4: To solve the complex Arithmetic problems practically with real time application problems

CO5: To think logically in solving problems enhance their decision making for difficult situations.

TEXT BOOKS:

1. Dr.E. Balagurusamy ,”Programming in C++” complete reference 8th Edition.
2. “THE COMPLETE REFERENCE PYTHON”, Herbert schildt., McGraw Hill Education, 2011.

3. Python: The Complete Reference by Martin Brown and Martin C. Brown Published in 2014.
4. Python in a nutshell by Alex Martelli Revised in March 2013.
5. Dr. R.S Agrawal, “Quantitative Aptitude” and Non Verbal Reasoning published in 2000

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- <https://www.indiabix.com/aptitude/questions-and-answers/>
- <https://m4maths.com/placement-puzzles.php>
- [www.freshers world.com](http://www.freshersworld.com)
- www.careerride.com
- www.youtube.com/watch/python
- [www.youtube.com/watch/concepts of python](http://www.youtube.com/watch/concepts%20of%20python)
- <https://stackoverflow.com/>
- <https://www.w3schools.com/>
- <https://www.geeksforgeeks.org/>

JAL2511	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To enable the students make use of data sets in implementing the machine learning algorithms.
- To demonstrate implementation of the machine learning concepts and algorithms.

LIST OF EXERCISES

1. Perform the following operations on matrices:
 - a. Matrix addition
 - b. Matrix subtraction
 - c. Matrix multiplication
 - d. Matrix inversion
 - e. Transpose of a Matrix
2. Perform the following basic operations on a matrix.
 - a. Find the minimum and maximum element of the matrix.
 - b. Find the minimum and maximum element of each row and column in the matrix.
 - c. Find trace and rank of the given matrix.
 - d. Find eigenvalues and eigenvectors of the given matrix.
3. Create a data frame with columns for at least 5 observations.
 - a. Retrieve a particular column from the DataFrame.
 - b. Summarize the data frame and observe the statistics of the DataFrame created.
 - c. Observe the mean and standard deviation of the data frame and print the values.
4. Programs to implement prediction algorithms.
 - a. Implement the Linear Regression for a sample training data set stored as a .CSV file. Compute Mean Square Error by considering few test data sets.
 - b. Implement the Non-linear Regression for a sample training data set stored as a .CSV file. Compute Mean Square Error by considering few test data sets.
 - c. Evaluate the performance of Linear Regression and Non-linear Regression based prediction models for heart disease diagnosis.
5. Programs to implement classification algorithms.
 - a. Implement the Logistic Regression for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier.
 - b. Implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy with a few test data sets.
 - c. Implement Support Vector Machine algorithm to classify the iris data set. Print both correct and wrong predictions.
 - d. Evaluate the performance of the above classifier models for heart disease diagnosis.
6. Implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions
7. Implement k-Means algorithm to cluster a set of data stored in a .CSV file.
8. Develop an application using machine learning algorithms for one of the following:
 - a. Economic data analysis
 - b. Video indexing
 - c. Heart disease diagnosis
 - d. Human Resource Management
 - e. Lung disease diagnosis
 - f. Anomaly Detection & Recommendation

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Understand the basic operations of Linear Algebra in Machine Learning.

- Use various Supervised and Unsupervised Learning techniques.
- Apply Statistical approaches for multiple learning techniques.
- Construct models for classification.
- Evaluate the performance of different models.

TEXTBOOKS:

1. Vijayvargia, Abhishek, “Machine Learning with Python: An Approach to Applied Machine Learning”, BPB Publications, 1st edition, 2018.
2. Aurelien Geron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow”, Oreilly, March 2017.
3. Dr. M Gopal, “Applied Machine Learning”, 1st Edition, McGraw-Hill, 2018.

WEBSITE REFERENCES:

1. <https://machinelearningmastery.com/>
2. <https://towardsdatascience.com/>
3. <https://www.kaggle.com/datasets>
4. <https://www.nvidia.com/en-us/glossary/scikit-learn/>

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

HARDWARE:

Stand-alone desktops 30 Nos. (or) Server supporting 30 terminals or more

SOFTWARE:

Programming language: Python

Libraries: Numpy, Pandas, Matplotlib, seaborn, scikit-learn.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	3	3	-	1	-	-	-	1	2	2	1
CO2	2	3	3	2	3	3	-	1	-	-	-	1	2	2	1
CO3	2	3	3	2	3	3	-	1	-	-	-	1	2	2	1
CO4	2	3	3	2	3	3	-	1	-	-	-	1	2	2	1
CO5	2	3	3	2	3	3	-	1	-	-	-	1	2	2	1

JGE2542	MERN STACK DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2

Module 1: Introduction to Full Stack Development

- Understanding Web Development Architecture
- Overview of Frontend, Backend, and Database Systems
- Introduction to MERN Stack

Module 2: MongoDB Essentials

- Introduction to NoSQL Databases
- CRUD Operations with MongoDB
- Designing Data Models and Schemas

Module 3: Express.js and Node.js Fundamentals

- Setting up Node.js Environment
- Building RESTful APIs with Express.js
- Middleware and Routing Concepts

Module 4: React.js Development

- Introduction to React Framework
- Components, Props, and State Management
- Building Interactive User Interfaces

Module 5: Integrating MERN Stack Applications

- Connecting Frontend to Backend APIs
- Managing Authentication and Authorisation (JWT)

Deployment and Hosting Best Practices

JAD2601	TEXT AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the fundamental concepts of Natural Language Processing (NLP) and speech recognition.
- To describe the architecture and function of basic language models.
- To apply basic techniques used in dialogue systems .
- To implement feature extraction methods in speech recognition
- To analyze different algorithms used for speech recognition and synthesis.

PREREQUISITE: Artificial Intelligence

UNIT I INTRODUCTION TO TEXT AND SPEECH ANALYSIS 9

Overview of Text and Speech Analysis-Applications of NLP and Speech Processing- Text Preprocessing Techniques, Text Representation N-grams, Bag of Words, Term Frequency–Inverse Document Frequency analysis-Topic Modeling: Latent Dirichlet Allocation

UNIT II TEXT CLASSIFICATION AND WORD EMBEDDINGS 9

Naive Bayes, Support Vector Machines, and Neural Networks-Word Embeddings: Word2Vec, GloVe,BERT

UNIT III QUESTION ANSWERING AND DIALOGUE SYSTEMS 9

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems - evaluating dialogue systems.

UNIT-IV SPEECH AND SIGNAL PROCESSING 9

Basics of Digital Speech Processing-Feature Extraction: Mel-Frequency Cepstral Coefficients, Linear Predictive Coding-Speech Recognition: Hidden Markov Models , Dynamic Time Warping Introduction to Automatic Speech Recognition Systems.

UNIT V EMERGING TRENDS IN TEXT AND SPEECH ANALYSIS 9

Speech Synthesis: Text-to-Speech , Systems-Cross-lingual Text and Speech Analysis- Neural Machine Translation, Multilingual BERT and XLM-R,Ethical Considerations in Text and Speech Processing.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Demonstrate an understanding of the basic principles of text and speech analysis, including NLP applications and speech recognition fundamentals.
- Utilize statistical models such as N-grams, Bag of Words, and TF-IDF to analyze textual data .
- Implement and evaluate basic dialogue systems
- Explain Hidden Markov Models (HMMs) to develop and evaluate speech recognition systems
- Elucidate,analyze different algorithms used for speech recognition and synthesis

TEXT BOOKS:

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, Third Edition, 2022

REFERENCES:

1. L. Ashok Kumar, D. Karthika Renuka, Deep Learning Approach for Natural Language Processing, Speech, and Computer Vision, 1st Edition, CRC Press, 2023.
2. Christopher D. Manning, Hinrich Schütze, Foundations of Statistical Natural Language Processing, MIT Press, 1999
3. Geetha, T. V. , “Understanding Natural Language Processing (Machine Learning and Deep Learning Perspectives)”. Pearson, 2024.
4. Uday Kamath, John Liu, and Jiawei Han, “Deep Learning for NLP and Speech Recognition”, Elsevier, 2020

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2. <https://www.tensorflow.org/tutorials/images/cnn>
3. <https://www.analyticsvidhya.com/blog/2021/06/transfer-learning-using-resnet50/>
4. <https://machinelearningmastery.com/develop-your-first-lstm-forecasting-model-in-python/>
5. <https://machinelearningmastery.com/what-are-generative-adversarial-networks/>

MAPPING OF CO WITH PO/PSO:

	Program Outcomes													
CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PS O1	PS O2
CO1	3	2	1	1	2	-	-	-	-	-	2	2	3	2
CO2	2	3	2	2	2	-	-	-	-	-	2	2	2	3
CO3	2	2	2	3	2	-	-	-	-	-	2	2	2	3
CO4	2	2	2	3	2	-	-	-	-	-	2	2	2	3
CO5	1	2	3	2	3	-	-	-	-	-	2	2	3	3

JAD2621	DEEP LEARNING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To explain the historical trends in deep learning and understand the significance of regularization, and optimization techniques.
- To describe the foundational principles of convolutional neural networks.
- To explain on strategies and methodologies of transfer learning
- To elucidate recurrent neural networks
- To detail out deep generative models and its variants

PREREQUISITE:

- Artificial Intelligence, Machine learning

UNIT I INTRODUCTION TO DEEP LEARNING 9

Introduction to Deep Learning – Historical Trends in Deep Learning – Challenges motivating deep learning; Deep Networks: Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Auto Encoders, Deep Learning Applications.

UNIT II CONVOLUTIONAL NEURAL NETWORKS 9

Convolution Operation - Sparse Interactions -Parameter Sharing - Equivariance - Pooling - Convolution Variants: Strided, Tiled Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -Loss Functions -Regularization - Optimizers -Gradient Computation.

UNIT III TRANSFER LEARNING 9

Advantages of Transfer learning -startegies- methodologies-transfer learning types - pretrained model for transfer learning : DenseNet, PixelNet, ResNet, AlexNet – Applications.

UNIT IV RECURRENT NEURAL NETWORKS 9

Unfolding Graphs -RNN Design Patterns: Acceptor - Encoder -Transducer; Gradient Computation - Sequence Modeling Conditioned on Contexts - Bidirectional RNN -- Sequence to Sequence RNN– Deep Recurrent Networks -- Recursive Neural Networks - Long Term Dependencies; Leaky Units: Skip connections and dropouts; Gated Architecture: LSTM

UNIT V AUTOENCODERS AND GENERATIVE MODELS IN DEEP LEARNING 9

Linear Factor Models-Auto encoders: Under complete Auto encoders-Regularized Auto encoders Stochastic Encoders and Decoders-Denoising Auto encoders-Learning with Auto encoders; Deep Generative Models; Variational auto encoders-Generative adversarial networks.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

1. Solving XOR problem using DNN
2. Classification of MNIST Dataset using CNN.
3. Character recognition using CNN
4. Language modeling using RNN
5. Sentiment analysis using LSTM
6. Parts of speech tagging using Sequence to Sequence architecture
7. Machine Translation using Encoder-Decoder model
8. Image augmentation using GANs

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Understand basics of Machine Learning.
- Understand the concepts of Deep Learning.
- Know about CNN and RNN to model for real world applications.
- Design and implement Deep Generative Models.
- Explore the deep learning applications.

TEXT BOOKS:

1. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.
2. Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018.

REFERENCES:

1. Sarkar, D. and Bali, R. and Ghosh, T. “Hands-On Transfer Learning with Python: Implement advanced deep learning and neural network models using TensorFlow and Keras”, Packt Publishing, 2018
2. Michael Nielsen, “Neural Networks and Deep Learning”, Determination Press, 2015
3. Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018.
4. Nikhil Buduma, “Fundamentals of Deep Learning: Designing Next- Generation Machine Intelligence Algorithms”, O’Reilly publications, 2019.

WEB REFERENCES:

- https://www.youtube.com/watch?v=4TC5s_xNKsS
- <https://www.javatpoint.com/deep-learning>
- <https://nptel.ac.in/courses/106106201>
- <https://www.youtube.com/watch?v=VyWAvY2CF9c>

MAPPING OF CO WITH PO/PSO:

	Program Outcomes												PSO	
CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PS O1	PS O2
CO 1	3	2	1	1	2	-	-	-	-	-	2	2	3	3
CO 2	2	3	2	2	2	-	-	-	-	-	2	2	3	3
CO 3	2	2	2	3	2	-	-	-	-	-	2	2	3	3
CO 4	2	2	2	3	2	-	-	-	-	-	2	2	3	3
CO 5	1	2	3	3	3	-	-	-	-	-	2	2	3	3

JAD2602	BIG DATA MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an overview of Big Data ecosystems and key components.
- To explain Hadoop's core components for distributed data processing.
- To elucidate Spark's architecture for scalable analytics and real-time processing.
- To equip students with skills in data ingestion, stream processing, and automation tools.
- To discuss on industry applications and emerging Big Data trends.

PREREQUISITE:

- Database Management Systems

UNIT I BIG DATA FUNDAMENTALS 9

Introduction to Big Data – Definition, Characteristics, and importance. The 5Vs of Big Data – Types of Data Storage for Big Data - Basic Big Data Processing with Hadoop - Introduction to NoSQL Databases - Real-Time Data Processing in Big Data

UNIT II HADOOP ECOSYSTEM 9

Hadoop Architecture – Core components: HDFS – File storage, Block replication, Fault tolerance, and scaling. YARN – Resource management and job scheduling. MapReduce – Programming model, Optimizations, and best practices. Hive – Basic Operations in Hive.

UNIT III APACHE SPARK AND ADVANCED DATA PROCESSING 9

Spark Architecture – RDDs, DataFrames, Spark SQL. Spark Core – Transformations, actions, and lazy evaluation. Spark Streaming – Real-time data processing and use cases. MLlib – Spark Performance Tuning – Optimizing Spark jobs for scalability

UNIT IV DATA INGESTION, STREAM PROCESSING, AND AUTOMATION 9

Sqoop – Data import/export between Hadoop and relational databases. Flume – Collecting and aggregating log data into HDFS. Kafka – Real-time data streaming and message queues. Zookeeper – Distributed coordination, leader election, and configuration management. Nifi – Automating data flow between different systems. Apache Drill – Schema-free querying of Big Data.

UNIT V BIG DATA APPLICATIONS 9

Emerging Trends – AI/ML, Edge Computing, Quantum Computing; Industry Applications – E-commerce, Healthcare, Finance, Smart Cities; Real-Time Processing – Kafka, Flink, Spark Streaming; Cloud & Big Data – AWS, Azure, GCP for scalable processing.

TOTAL: 45 PERIOD

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Understand Big Data concepts and ecosystems.
- Work with Hadoop for data storage and processing.
- Use Apache Spark for scalable analytics and real-time processing.
- Demonstrate and explain tools like Kafka, Flume, and Sqoop.
- Apply Big Data technologies to real-world use cases and trends.

TEXTBOOKS:

1. Tom White, “Hadoop: The Definitive Guide”, O'Reilly Media, 4th Edition, 2015
2. Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, “Learning Spark: Lightning - Fast Big Data Analysis”, O'Reilly Media, 2nd Edition, 2020

REFERENCES:

1. Viktor Mayer-Schönberger & Kenneth Cukier, “Big Data: A Revolution That Will Transform How We Live, Work, and Think”, Houghton Mifflin Harcourt, 2023.
2. Tyler Akidau, Slava Chernyak, Reuven Lax, “Streaming Systems”, O'Reilly Media, 2023.
3. Jan Kunigk, Ian Gorton, Lenny Liebmann, Ted Malaska, “Architecting Modern Data Platforms”, O'Reilly Media, 2023.
4. Tiwari, S., & Sagar, M., “Big Data Optimisation and Management in Supply Chain Management: A Systematic Literature Review”, Artificial Intelligence Review, 2023.

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- <https://www.datacamp.com>
- <https://aws.amazon.com/blogs/big-data/>
- <https://www.coursera.org/learn/big-data-management>
- <https://www.coursera.org/learn/cloud-storage-big-data-analysis-sql>
- <https://archive.nptel.ac.in/courses/106/106/106106142/>

Mapping of CO with PO/PSO

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

JPT2042	TECHNICAL SKILLS AND APTITUDE	L		T	P	C
		0		0	2	1

COURSE OBJECTIVES:

- To make students analyze and solve problem in technical as well as aptitude. Enhance the technical skills and basics of programming language
- To make the students understand how to apply the practical knowledge with real time applications.
- To make the students think and draw a conclusion from different scenarios.
- To help the students understand JAVA programming concepts
- To help the students understand concepts and develop new Applications in JAVA.

UNIT - 1: OBJECT-ORIENTED & ADVANCED PYTHON 6

Object-Oriented Programming (OOP) - Advanced Data Structures & Algorithms - Decorators & Closures - Regular Expressions & String Manipulation - Multi-threading & Multiprocessing.

UNIT - 2: JAVA FUNDAMENTALS 6

Introduction to Java - Data Types & Variables - Operators & Control Statements - Functions & Methods - Arrays & Strings.

UNIT-3: OBJECT-ORIENTED PROGRAMMING (OOP) & ADVANCED JAVA 6

Object-Oriented Programming (OOP) Basics - Exception Handling - Inheritance & Polymorphism - Collections Framework - File Handling & Serialization.

UNIT- IV: QUANTITATIVE APTITUDE 6

Permutation and combination: Letter, Number and circular permutation – Probability – Logarithm – Mensuration – Data sufficiency.

UNIT V: LOGICAL REASONING 6

Calendar – Visual Reasoning – Mirror Image and Water Image – Picture analogy – Pattern completion – Data Interpretation – Selection decision table.

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to

CO1: To enhance their knowledge in JAVA concepts.

CO2: To enhance knowledge in JAVA programming.

CO3: To gain knowledge in Coding the concepts of JAVA programming.

CO4: To solve the complex Arithmetic problems practically with real time application problems.

CO5: To think logically in solving problems enhance their decision making for difficult situations.

CO6: To enhance their employability skills and well prepared to face the MNCs Campus interviews.

TEXTBOOKS:

1. Herbert Schildt, "Java The complete reference", 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary Cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.
3. Dr. R.S Agrawal, "Quantitative Aptitude" and Non Verbal Reasoning published in 2000.
4. S. Chand – A Modern Approach to Logical Reasoning Published in 2000.

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- <https://m4maths.com/placement-puzzles.php>
- www.freshersworld.com
- www.careerride.com
- www.youtube.com/watch/python
- [www.youtube.com/watch/concepts of python](http://www.youtube.com/watch/concepts%20of%20python)
- <https://stackoverflow.com/>
- <https://www.w3schools.com/>
- <https://www.geeksforgeeks.org/>

JHS2541	PROFESSIONAL COMMUNICATION	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To enhance reading comprehension and oral communication through self-reflection and peer feedback.
- To improve listening and speaking skills through exposure to diverse accents and group discussions.
- To develop professional writing and critical thinking through email composition and career-related tasks.
- To refine presentation skills and job application writing for effective workplace communication.
- To build interview confidence and problem-solving abilities through simulations and case analysis.

LIST OF EXPERIMENTS AND ACTIVITIES:

1. Reading: 21st Century Skills

Activity: Read an article or infographic on 21st-century skills, summarize key skills and conduct a quiz.

2. Speaking: Self-introduction

Activity: Deliver a 2 to 3-minute self-introduction or elevator pitch and receive peer feedback on content and delivery.

3. Listening: Accents in English

Activity: Listen to English audio clips in British, American, and Indian accents and answer comprehension questions based on the content.

4. Speaking: Group Discussion Dynamics

Activity: Participate in a formal group discussion on a current or technical topic and observe turn-taking, assertiveness, and relevance.

5. Writing: Working in Virtual Teams

Activity: Conduct a virtual team-based design challenge, simulate and record a remote meeting, and complete a reflective report on communication effectiveness.

6. Reading: Career Planning and Research Proposals

Activity: Read and analyse a sample career plan or research proposal, extract key points and compare effectiveness.

7. Speaking: Presentation Skills

Activity: Prepare and deliver a 4 to 5-minute oral or PPT presentation on a technical or career-related topic and receive peer and instructor feedback.

8. Writing: Job Application and Resume Writing

Activity: Prepare a tailored cover letter and resume—both by mail and email—for a specific job description, emphasizing clarity, proper formatting, and relevance.

9. Speaking: Interview Skills

Activity: Participate in mock interviews in pairs or with instructors, practice behavioural questions and receive structured feedback.

10. Listening: Professional Challenges

Activity: Listen to workplace case studies based on real-life experiences shared by friends or relatives, identify challenges and discuss possible solutions and ethical

considerations.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able:

- To demonstrate improved reading and speaking through summarization and structured self-introductions
- To apply listening and discussion strategies by interpreting diverse accents and engaging in collaborative dialogues
- To produce professional emails and analyse career-related documents with clarity
- To deliver concise presentations and craft effective job applications tailoring to contexts
- To show interview readiness and ethical awareness by engaging in mock interviews and analysing workplace challenges.

TEXT BOOKS:

1. Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice Oxford University Press, 2022.
2. Pushp Lata & Sanjay Kumar, Communication Skills, Oxford University Press, 2011.

REFERENCES:

1. Alex, K, 2019, Soft Skills: Know Yourself and Know the World, New Delhi: S. Chand & Company Limited.
2. Butterfield, Jeff, 2015, Soft Skills for Everyone. New Delhi: Cengage Learning.
3. Dhawan, Erica. (2021). Digital Body Language: How to Build Trust and Connection, No Matter the Distance. New York: St. Martin's Press.
4. Gallo, Carmine. (2014). Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds. New York: St. Martin's Press.
5. Interact English Lab Manual for Undergraduate Students, 2016, Hyderabad: Orient BlackSwan.
6. Mitra, Barun K, 2016, Personality Development and Soft Skills, New Delhi: Oxford University Press.
7. Raman, Meenakshi and Sangeeta Sharma, 2022, Professional Communication, Oxford: Oxford University Press.
8. Rizvi, Ashraf, M, 2018, Effective Technical Communication, Chennai: McGraw-Hill Education.

WEB LINKS:

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2. <https://owl.purdue.edu/>
3. <https://www.mindtools.com/>
4. <https://www.toastmasters.org/resources/public-speaking-tips>
5. <https://www.ted.com/topics/communication>
6. <https://learnenglish.britishcouncil.org/skills>
7. <https://www.indeed.com/career-advice/resumes-cover-letters>
8. <https://www.skillsyouneed.com/>

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	2	3	-	1	-	-	2
CO2	-	-	-	-	-	2	-	-	2	3	-	1	-	-	2
CO3	-	-	-	-	-	2	-	-	2	3	-	1	-	-	2
CO4	-	-	-	-	-	2	-	-	2	3	-	1	-	-	2
CO5	-	-	-	-	-	2	-	-	2	3	-	1	-	-	2

JAD2611	BIG DATA MANAGEMENT LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To explain Hadoop ecosystem and learn basic HDFS and Hive operations.
- To demonstrate HiveQL for data analysis and transformation tasks.
- To Develop and chain Map Reduce jobs for custom processing workflows.
- To Explore Spark for big data processing using RDDs and Data Frames.
- To perform EDA and modelling on real world dataset

LIST OF EXPERIMENTS

1. Configure a Hadoop cluster and perform essential HDFS operations such as starting the Hive shell, creating, listing, and switching databases, defining and managing tables (creating, listing, and describing table schemas), loading and inserting data into tables, querying data, deleting records, and dropping tables. Execute a MapReduce job for word count using Hadoop and analyze both the input and output data.
2. Create a Hive table from a CSV file and load the data into it.
3. Write HiveQL queries to count records, calculate average glucose levels, and filter patients with high BMI.
4. Write a custom MapReduce program to count vowels in a text file.
5. Chain two MapReduce jobs to perform word count and sort words by frequency.
6. Use the Spark shell to read a text file, split lines into words, and count word frequencies using RDDs.
7. Load a CSV file into a Spark DataFrame and perform filtering, grouping, and aggregation operations.
8. Perform descriptive analytics on a dataset including mean, median, mode, and variance, with visualizations.
9. Pima Indians Diabetes Dataset – EDA: Load dataset, clean data, calculate descriptive statistics, visualize distributions (histograms, boxplots), find correlations, create heatmap, analyze features, and build a simple model (logistic regression).

TOTAL: 60 PERIODS

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE: Java 8, Hadoop 3.x, Hive 3.x, Spark 3.x, Python, and libraries: pandas, numpy, matplotlib, seaborn, scikit-learn.

HARDWARE: Standalone desktops of 30 Nos

COURSE OUTCOME:

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

- Demonstrate the ability to set up Hadoop and perform basic file and Hive operations.
- Apply HiveQL to manipulate and analyze structured data effectively.
- Design and implement custom MapReduce programs for text processing tasks.
- Utilize Apache Spark for large-scale data processing and transformation.
- Conduct exploratory data analysis and modeling on real-world datasets.

TEXTBOOKS:

3. Tom White, “Hadoop: The Definitive Guide”, O'Reilly Media, 4th Edition, 2015
4. Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, “Learning Spark: Lightning - Fast Big Data Analysis”, O'Reilly Media, 2nd Edition, 2020

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6. Tyler Akidau, Slava Chernyak, Reuven Lax, “Streaming Systems”, O'Reilly Media, 2023.
7. Jan Kunigk, Ian Gorton, Lenny Liebmann, Ted Malaska, “Architecting Modern Data Platforms”, O'Reilly Media, 2023.
8. Tiwari, S., & Sagar, M., “Big Data Optimisation and Management in Supply Chain Management: A Systematic Literature Review”, Artificial Intelligence Review, 2023.

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- <https://aws.amazon.com/blogs/big-data/>
- <https://www.coursera.org/learn/big-data-management>
- <https://www.coursera.org/learn/cloud-storage-big-data-analysis-sql>
- <https://archive.nptel.ac.in/courses/106/106/106106142/#>

MAPPING OF CO WITH PO/PSO

	Program Outcomes												PSO	
CO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	1	2	1	1	-	-	-	-	-	-	1	2	2	2
CO2	2	2	2	1	3	-	-	-	-	-	2	2	2	2
CO3	2	1	2	1	3	-	-	-	-	-	1	2	2	2
CO4	2	2	-	-	3	-	-	-	-	-	1	2	2	2
CO5	2	2	3	2	3	-	-	-	-	-	2	2	2	2

JGE2642	COMPUTATIONAL INTELLIGENCE LABORATORY	L 0	T 0	P 4	C 2
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COURSE OBJECTIVES:

- Introduce students to real-world tools and platforms used in the tech industry.
- Provide knowledge in information security
- Impart skills related to AR & VR
- Build hands-on skills in security testing, immersive technology development, and AI/ML workflows.
- Enable mini-projects or prototypes aligning with current trends.

UNIT I FUNDAMENTALS

12

Recap of basic programming knowledge (preferably Python and C/C++), Linux and CLI-Internet access and version control (Git/GitHub)M - Basics of networking, OS concepts - Basic 3D geometry, Unity or Unreal fundamentals -Linear algebra, probability, Python, NumPy, Pandas

UNIT II INFORMATION SECURITY

12

Introduction to Cybersecurity - Footprinting, reconnaissance, and VM setup (Kali Linux) - Vulnerability Assessment - Network scanning with Nmap, Nessus, and Wireshark -Web Application Security - OWASP Top 10, SQL Injection, XSS using DVWA

UNIT III AR & VR

12

Intro to AR/VR Platforms - Unity basics, setting up AR/VR environments -Augmented Reality - ARCore or Vuforia: AR object placement, interaction -Virtual Reality - Unity with Oculus or Google Cardboard: 3D world navigation

UNIT IV MACHINE LEARNING & DEEP LEARNING

12

ML Basics with Scikit-learn - Train/test models: classification (e.g., spam detection) -Deep Learning with TensorFlow/Keras - Build an image classifier using CNN -Transfer Learning - Use pre-trained models (e.g., MobileNet, ResNet)

UNIT V MINI PROJECT

12

Password & Access Controls - Hash cracking using John the Ripper, Rainbow Tables - Create an AR/VR prototype (e.g., virtual showroom, AR guide) -Deploy a model in a web app (e.g., using Flask/Streamlit)

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On completion of the course, the students should be able to:

- Learned fundamentals of basic programming knowledge.
- Gained knowledge on ethical hacking fundamentals and tools
- Programming Knowledge and skills related to AR & VR
- Enhanced their vision on machine learning and deep learning
- use advanced scripting and programming to develop mini-projects and prototypes aligning with current trends.

Tools:

- Kali Linux, Metasploit, Burp Suite, Wireshark
- Unity3D, Vuforia/ARCore/ARKit, Oculus SDK or Cardboard SDK
- Jupyter, TensorFlow/Keras, Scikit-learn, Google Colab

LAB REQUIREMENTS**Hardware:**

- PCs with minimum 8GB RAM, i5 processor, GPU recommended for DL module
- Android devices/AR-capable phones or VR headsets (Oculus Rift/Quest or Google Cardboard)

Software:

- VirtualBox/Vagrant (for cybersecurity labs)
- Unity3D (latest version)
- Python (3.10+), Anaconda
- TensorFlow, Scikit-learn, OpenCV
- GitHub Classroom or GitLab for submissions

SEMESTER VII

JHS2741	UNIVERSAL HUMAN VALUES	L	T	P	C
		1	0	2	2

COURSE OBJECTIVES:

The objective of the course is four-fold:

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

MODULE I: INTRODUCTION

(3L, 6P)

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration– Its content and process; ‘Natural acceptance’ and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Practical Session: Include sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

MODULE II: HARMONY IN THE HUMAN BEING

(3L, 6P)

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

Practical Session: Include sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

MODULE III: HARMONY IN THE FAMILY AND SOCIETY

(3L, 6P)

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided

Society, Universal Order- from family to world family.

Practical Session: Include sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

MODULE IV: HARMONY IN THE NATURE AND EXISTENCE (3L, 6P)

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.

Practical Session: Include sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

MODULE V: IMPLICATIONS OF HARMONY ON PROFESSIONAL ETHICS (3L, 6P)

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Sum up.

Practical Session: Include Exercises and Case Studies will be taken up in Sessions E.g. To discuss the conduct as an engineer or scientist etc.

TOTAL: 45 (15 Lectures + 30 Practicals) PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

By the end of the course, the students will be able to:

- CO1: Become more aware of themselves, and their surroundings (family, society, nature);
- CO2: Have more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- CO3: Have better critical ability.
- CO4: Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- CO5: Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

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3. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, NewDelhi, 3rd revised edition, 2023.
4. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
5. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
6. The Story of Stuff (Book).
7. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

8. Small is Beautiful - E. F Schumacher.
9. Slow is Beautiful - Cecile Andrews.
10. Economy of Permanence - J C Kumarappa
11. Bharat Mein Angreji Raj – Pandit Sunderlal
12. Rediscovering India - by Dharampal
13. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
14. India Wins Freedom - Maulana Abdul Kalam Azad
15. Vivekananda - Romain Rolland (English)
16. Gandhi - Romain Rolland (English)

WEB REFERENCES:

1. Class preparations: <https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php>
2. Lecture presentations: https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php
3. Practice and Tutorial Sessions: <https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	1	1	1	3	-	-	3	-	-	2
CO2	-	-	-	-	-	1	1	1	3	-	-	3	-	-	2
CO3	-	-	-	-	-	3	3	2	3	-	1	3	-	-	2
CO4	-	-	-	-	-	3	3	2	3	-	1	3	-	-	2
CO5	-	-	-	-	-	3	3	3	3	-	2	3	-	-	2

JGE2751	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- Learn basic concepts in entrepreneurship, develop mind-set and skills necessary to explore entrepreneurship.
- Apply process of problem - opportunity identification and validation through human-centered approach to design thinking in building solutions as part of engineering projects.
- Analyze market types, conduct market estimation, identify customers, create customer persona, develop the skills to create a compelling value proposition and build a minimum viable product.
- Explore business models, create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture ideas & solutions built with domain expertise.
- Prepare and present an investible pitch deck of their practice venture to attract stakeholders.

MODULE – I: ENTREPRENEURIAL MINDSET

4L, 8P

Introduction to Entrepreneurship: Definition – Types of Entrepreneurs – Emerging Economics – Developing and Understanding an Entrepreneurial Mindset – Importance of Technology Entrepreneurship – Benefits to the Society.

Case Analysis: Study cases of successful & failed engineering entrepreneurs - Foster Creative Thinking: Engage in a series of Problem-Identification and Problem-Solving tasks.

MODULE – II: OPPORTUNITIES

4L, 8P

Problems and Opportunities – Ideas and Opportunities – Identifying problems in society – Creation of opportunities – Exploring Market Types – Estimating the Market Size, - Knowing the Customer and Consumer - Customer Segmentation - Identifying niche markets – Customer discovery and validation; Market research techniques, tools for validation of ideas and opportunities

Activity Session: Identify emerging sectors / potential opportunities in existing markets - Customer Interviews: Conduct preliminary interviews with potential customers for Opportunity Validation - Analyse feedback to refine the opportunity.

MODULE – III: PROTOTYPING & ITERATION

4L, 8P

Prototyping – Importance in entrepreneurial process – Types of Prototypes - Different methods – Tools & Techniques.

Hands-on sessions on prototyping tools (3D printing, electronics, software), Develop a prototype based on identified opportunities; Receive feedback and iterate on the prototypes.

MODULE – IV: BUSINESS MODELS & PITCHING

4L, 8P

Business Model and Types - Lean Approach - 9 block Lean Canvas Model - Riskiest assumptions to Business Models – Using Business Model Canvas as a Tool – Pitching Techniques: Importance of pitching - Types of pitches - crafting a compelling pitch – pitch presentation skills - using storytelling to gain investor/customer attention.

Activity Session: Develop a business model canvas for the prototype; present and receive feedback from peers and mentors - Prepare and practice pitching the business ideas- Participate in a Pitching Competition and present to a panel of judges - receive & reflect feedback.

MODULE – V: ENTREPRENEURIAL ECOSYSTEM

4L, 8P

Understanding the Entrepreneurial Ecosystem – Components: Angels, Venture Capitalists, Maker Spaces, Incubators, Accelerators, Investors. Financing models – equity, debt, crowdfunding, etc, Support from the government and corporates. Navigating Ecosystem Support: Searching & Identifying the Right Ecosystem Partner – Leveraging the Ecosystem - Building the right stakeholder network.

Activity Session: Arrangement of Guest Speaker Sessions by successful entrepreneurs and entrepreneurial ecosystem leaders (incubation managers; angels; etc), Visit one or two entrepreneurial ecosystem players (Travel and visit a research park or incubator or makerspace or interact with startup founders).

TOTAL 60 PERIODS

COURSE OUTCOMES

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

- CO1: Develop an Entrepreneurial Mind-set and Understand the Entrepreneurial Ecosystem Components and Funding types
- CO2: Comprehend the process of opportunity identification through design thinking, identify market potential and customers
- CO3: Generate and develop creative ideas through ideation techniques
- CO4: Create prototypes to materialize design concepts and conduct testing to gather feedback and refine prototypes to build a validated MVP
- CO5: Analyse and refine business models to ensure sustainability and profitability Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders.

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6. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition
7. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business
8. Blank, S. G., & Dorf, B. (2012). The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch
9. Roy, R. (2017). Indian Entrepreneurship: Theory and Practice. New Delhi: Oxford University Press
10. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO2	3	2	3	2	3	-	-	-	-	-	-	1			
CO3	3	3	3	3	3	-	-	-	1	-	1	2			
CO4	3	3	3	2	3	-	-	-	1	-	1	2			
CO5	3	3	3	3	3	-	-	-	3	3	1	1			

JAD2741	COMPREHENSION AND TECHNICAL SEMINAR	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To revamp the knowledge gained in the semester and prepare the students to face interview both at the academic and the industrial sector.
- To encourage the students to study about the recent developments in the field.
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as power point presentation and demonstrative models.

METHOD OF EVALUATION:

COMPREHENSION:

One period is allotted for comprehension. During this period, a test with objective type questions from competitive exams is conducted in identified technical courses. The evaluation is purely internal. Average of all the test marks shall be calculated, a weightage of 50 marks is awarded to the comprehension component.

TECHNICAL SEMINAR:

Three periods are allotted for the technical seminar. During the seminar session each student is expected to prepare and present a technical topic for duration of 10 minutes.

Each student is expected to make presentation at least twice during the semester and the student is evaluated based on various parameters such as topic chosen, content delivery, communication skills and presentation. A faculty guide is allotted who shall guide and monitor the progress and attendance of all the students. Equal weightage is considered for the two seminar sessions for a total weightage of 50 marks.

The total mark awarded for the course shall be the sum of marks scored out of 50 each for the two components. Evaluation is purely internal.

EVALUATION:

Technical Seminar (50)	Comprehension (50)	Total (100)	Internal Marks (50)	Internal Marks (100)
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TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Consolidate all the engineering concepts acquired in the course of study.
- Enrich their technical knowledge.
- Prepare and present technological developments.
- Communicate effectively the concepts related to the various topics.
- Face the interviews with confidence during the placement drive

JAD2742	INTERNSHIP	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

To enable the students to

- Get connected with reputed industry/ laboratory/academia / research institute
- Get practical knowledge on Product Development / Software Design and Development / Testing / Analytics/ research/ startups/ professionalism / business processes and insights / domain knowledge/ Industry Practices/ and other related aspects and develop skills to solve related problems
- Develop technical, soft, team skills to cater to the needs of the industry / academia / businesses / research / organizations in the core aspects of Automation, Digitalization

The students may undergo Industrial training for a period as specified in the Curriculum during summer/winter vacation. In this case the training has to be undergone continuously for the entire period.

In lieu of Industrial training, students may undergo Internship at Industry / Research organizations / University (after due approval from Head of the Department) during the IV,V or VI semester breaks for a continuous period of 30 days to an Industry / Organization / University and two credit is allotted in the Seventh semester based on a viva voce examination. The Industrial / Practical Training, Summer Project, Internship, shall carry 100 marks and shall be evaluated through internal assessment only.

At the end of Industrial/Practical Training/Internship/ Summer Project, the student shall submit an attendance certificate from the organization where he / she has undergone training and a brief report. The evaluation will be made based on this report and a viva-voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Institution consisting of the course coordinator and two experts from the Department. The certificates (issued by the organization) submitted by the students shall be attached to the mark list sent by the Head of the Institution to the Controller of Examinations.

EVALUATION :

Internship Report (40)	Presentation (30)	Viva Voce (30)	Total Marks (100)
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Number of days : 30

COURSE OUTCOMES:

On completion of the course, the student will know about

CO1: Industry Practices, Processes, Techniques, technology, automation and other core aspects of software industry

CO2: Analyze, Design solutions to complex business problems

CO3: Build and deploy solutions for target platform

CO4: Preparation of Technical reports and presentation.

CO5: Ability to acknowledge the value of continuing education for oneself and to stay up with technology advancements.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	2	2	2
CO2	-	-	-	3	3	-	-	-	-	-	-	-	2	2	2
CO3	-	-	-	-	-	3	-	3	-	-	-	-	2	2	2
CO4	-	-	-	-	-	-	-	3	3	3	3	-	2	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	3	2	2	2

SEMESTER VIII

JAD2831	PROJECT WORK	L	T	P	C
		0	0	20	10

COURSE OBJECTIVES:

- To develop the ability to solve a specific problem related to their subject expertise.
- To develop the methodology to solve the identified problem.
- To design, analyze and implement the chosen problem using the hardware components.
- To validate the simulation, hardware results with the theoretical results.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

METHOD OF EVALUATION:

The students in a group of 3 to 4 work on a topic approved by the Head of the Department under the guidance of a faculty member, prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee is constituted by the Head of the Department. The project work is evaluated based on oral presentation and the project report, jointly by external and internal examiners.

PROJECT EVALUATION

ZEROth REVIEW

Novelty/Problem Identification & Objectives (20)	Literature survey (30)	Methodology (10)	Guide (20)	PowerPoint Presentation (20)			Total (100)
				BL (5)	CS (5)	CP (10)	

FIRST REVIEW

Implementation of Methodology (20)	Design/ Analysis/ Testing/ Algorithm/Model (30)	Inferences (10)	Guide (20)	Power Point Presentation (20)			Total (100)
				BL (5)	CS (5)	CP (10)	

SECOND REVIEW

Progress (20)	Results (30)	Preparation of Conference Paper (10)	Guide (20)	Power Point Presentation (20)			Total (100)
				BL (5)	CS (5)	CP (10)	

THIRD REVIEW

Results & Discussions (30)	Conclusions (20)	Publications (10)	Guide (20)	Power Point Presentation (20)			Total (100)
				BL (5)	CS (5)	CPS (10)	

BL - Body Language, CS-Communication Skills, CP-Content of Presentation

TOTAL: 300 PERIODS

END SEMESTER EXAM

Project report (External Only) (30)	Result/Demonstration (30)		Power Point Presentation (20)		Viva (External Only) (20)	Total (100)
	Internal	External	Internal	External		

COURSE OUTCOMES:

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

- Apply the technical knowledge acquired for solving real world problems.
- Develop skills such as self-learning, critical thinking, problem solving, project management and finance.
- Apply modern tools and techniques for implementing the project.
- Work with team mates and collectively work towards the success of the project.
- Communicate effectively to present the outcomes of the project both in written and oral forms.

CO/PO MAPPING :

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

JIT2001	APP DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn development of web applications with basic GUI Components
- To develop cross-platform applications with event handling
- To develop applications with location and data storage capabilities
- To develop web applications with database access
- To learn non-functional characteristics of app frameworks

UNIT-I FUNDAMENTALS OF MOBILE AND WEB APPLICATION DEVELOPMENT

9

Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design

UNIT-II APP DEVELOPMENT USING JAVA

9

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Development Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS

UNIT-III HYBRID APP DEVELOPMENT

9

Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks

UNIT-IV CROSS-PLATFORM APP DEVELOPMENT

9

Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross-platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native and Native Components

UNIT-V NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS

9

Comparison of different App frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

- Develop Native applications with GUI Components.
- Develop hybrid applications with basic event handling.
- Implement cross-platform applications with location and data storage capabilities.
- Implement cross platform applications with basic GUI and event handling.
- Develop web applications with cloud database access.

TEXT BOOKS

1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition, 2015
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing

REFERENCES

1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition , 2018
2. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, International Edition , Matt Triff, Pawan Lingras, Rucha Lingras , CENGAGE Learning, 2016
3. React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition

WEBSITE REFERENCES

- <https://www.geeksforgeeks.org/web-development/>
- <https://www.startechup.com/blog/app-development-with-java/>
- <https://www.turing.com/resources/hybrid-mobile-app-development>
- <https://www.browserstack.com/guide/build-cross-platform-mobile-apps>
- <https://www.geeksforgeeks.org/non-functional-requirements-in-software-engineering/>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	1	1	1	-	-	-	2	1	3	2
CO-2	3	1	2	3	2	-	-	-	1	2	3	1
CO-3	1	1	3	1	3	-	-	-	3	3	1	1
CO-4	1	1	1	2	3	-	-	-	2	3	3	1
CO-5	1	3	3	2	2	-	-	-	1	3	1	2
Avg	1.8	1.8	2	1.8	2.2	-	-	-	1.8	2.4	2.2	1.4

JIT2002	CLOUD SERVICES MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce Cloud Service Management terminology, definition & concepts
- To compare and contrast cloud service management with traditional IT service management
- To identify strategies to reduce risk and eliminate issues associated with adoption of cloud services
- To Select appropriate structures for designing, deploying and running cloud-based services in a business environment
- To illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

UNIT-I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 9

Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models

UNIT-II CLOUD SERVICES STRATEGY 9

Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture

UNIT-III CLOUD SERVICE MANAGEMENT 9

Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service

Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management

UNIT-IV CLOUD SERVICE ECONOMICS

9

Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models

UNIT-V CLOUD SERVICE GOVERNANCE & VALUE

9

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

- Exhibit cloud-design skills to build and automate business solutions using cloud technologies.
- Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services
- Solve the real world problems using Cloud services and technologies
- Analyse the cloud service economics Cloud Cost Models
- Explain the various cloud service governance and its values

TEXT BOOKS

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications 2020
2. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mohammad 2013
3. Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour 2015

REFERENCES

1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing 2020
2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi 2013

WEBSITE REFERENCES

- <https://cloud.google.com/learn/what-is-cloud-management>
- <https://learn.microsoft.com/en-us/azure/cloud-adoption-framework/organize/cloud-strategy>
- <https://www.geeksforgeeks.org/economics-of-cloud-computing/>
- <https://www.isaca.org/resources/news-and-trends/newsletters/atisaca/2021/volume-3/building-cloud-governance-from-the-basics>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	1	1	1	-	-	-	2	1	3	2
CO-2	3	1	2	3	2	-	-	-	1	2	3	1
CO-3	1	1	3	1	3	-	-	-	3	3	1	1
CO-4	1	1	1	2	3	-	-	-	2	3	3	1
CO-5	1	3	3	2	2	-	-	-	1	3	1	2
Avg	1.8	1.8	2	1.8	2.2	-	-	-	1.8	2.4	2.2	1.4

JIT2003	UI AND UX DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype

UNIT I FOUNDATIONS OF DESIGN

9

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

UNIT II FOUNDATIONS OF UI DESIGN

9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

UNIT III FOUNDATIONS OF UX DESIGN

9

Introduction to User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals

UNIT IV WIREFRAMING, PROTOTYPING AND TESTING

9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Synthesizing Test Findings - Prototype Iteration

UNIT V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE

9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

- Build UI for user Applications
- Evaluate UX design of any product or application
- Demonstrate UX Skills in product development
- Implement Sketching principles
- Create Wireframe and Prototype

TEXT BOOKS

1. Joel Marsh, “UX for Beginners”, O’Reilly , 2022
2. Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services” O’Reilly 2021

REFERENCES

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3 rd Edition , O’Reilly 2020
2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018
3. Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, Third Edition, 2015

WEBSITE REFERENCES

- <https://www.nngroup.com/articles/>
- <https://www.interaction-design.org/literature.>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	1	1	3	1	-	-	-	3	3	2	1
CO-2	2	3	1	3	2	-	-	-	1	2	2	2
CO-3	1	3	3	2	2	-	-	-	2	3	1	2
CO-4	1	2	3	3	1	-	-	-	3	2	1	3
CO-5	1	2	3	2	1	-	-	-	2	1	1	1
Avg	1.6	2.2	2.2	2.6	1.4	-	-	-	2.2	2.2	1.4	1.8

JIT2004	DEVOPS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce DevOps terminology, definition & concepts.
- To understand the different Version control tools.
- To understand the concepts of Continuous Integration and Testing.
- To understand Configuration management using Ansible.
- Illustrate the benefits and drive the adoption of cloud-based Dev ops tools to solve real world problems

UNIT I INTRODUCTION TO DEVOPS 9

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

UNIT II COMPILE AND BUILD USING MAVEN & GRADLE 9

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases (compile build, test, package) Maven Profiles, Maven repositories (local, central, global), Maven plugins, Maven create and build Artifacts, Dependency management, Installation of Gradle, Understand build using Gradle

UNIT III CONTINUOUS INTEGRATION USING JENKINS 9

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a

Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNIT IV CONFIGURATION MANAGEMENT USING ANSIBLE 9

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

UNIT V BUILDING DEVOPS PIPELINES USING AZURE 9

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file

COURSE OUTCOMES:

- Understand different actions performed through Version control tools like Git.
- Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
- Ability to Perform Automated Continuous Deployment
- Ability to do configuration management using Ansible

- Understand to leverage Cloud-based DevOps tools using Azure DevOps

TOTAL: 45 PERIODS

TEXT BOOKS

1. Roberto Vormittag, “A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises”, Second Edition, Kindle Edition, 2016.
2. Jason Cannon, “Linux for Beginners: An Introduction to the Linux Operating System and Command Line”, Kindle Edition, 2014

REFERENCES

1. Hands-On Azure Devops: Cidc Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
2. Jeff Geerling, “Ansible for DevOps: Server and configuration management for humans”, First Edition, 2015.
3. David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps”, Second Edition, 2016.
4. Mariot Tsitoara, “Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer”, Second Edition, 2019.
5. <https://www.jenkins.io/user-handbook.pdf>
6. <https://maven.apache.org/guides/getting-started/>

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	1	1	3	1	-	-	-	3	3	2	1
CO-2	2	3	1	3	2	-	-	-	1	2	2	2
CO-3	1	3	3	2	2	-	-	-	2	3	1	2
CO-4	1	2	3	3	1	-	-	-	3	2	1	3
CO-5	1	2	3	2	1	-	-	-	2	1	1	1
Avg	1.6	2.2	2.2	2.6	1.4	-	-	-	2.2	2.2	1.4	1.8

JIT2005	WEB SECURITY AND PRIVACY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To familiarize the fundamentals of web application security
- To help students understand the wide aspects of secure development and deployment of web applications
- To explain how to build secure APIs
- To make understand the basics of vulnerability assessment and penetration testing
- To explain about Hacking techniques and Tools

UNIT I FUNDAMENTALS OF WEB APPLICATION SECURITY 9

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation.

UNIT II SECURE DEVELOPMENT AND DEPLOYMENT 9

Web Applications Security - Security Testing, Security Incident Response Planning, the Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)

UNIT III SECURE API DEVELOPMENT 9

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys, OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT IV VULNERABILITY ASSESSMENT AND PENETRATION TESTING 9

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database-based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT V HACKING TECHNIQUES AND TOOLS 9

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.

TOTAL : 45 PERIODS

Course Outcome:

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

- Discuss the basic concepts of web application security and the need for it
- Explain the process for secure development and deployment of web applications
- Make use of the skill to design and develop Secure Web Applications that use Secure APIs
- Analyze the problem and carry out vulnerability assessment and penetration testing
- Acquire the skill to think like a hacker and to use hackers tool sets for ethical hacking.

TEXT BOOKS:

1. Andrew Hoffman, “Web Application Security: Exploitation and Counter measures for ModernWeb Applications”, First Edition, O’Reilly Media, Inc. 2020,
2. Bryan Sullivan, Vincent Liu, “Web Application Security: A Beginners Guide”,The McGraw-Hill Companies ,2012,.

REFERENCES:

1. Ravi Das and Greg Johnson, “ Testing and Securing Web Applications”, Taylor & Francis Group, LLC, 2021,
2. Prabath Siriwardena, “Advanced API Security”, Apress Media LLC, USA, 2020.
3. Malcom McDonald, “Web Security for Developers”, No Starch Press, Inc.2020,
4. Neil Madden, “API Security in Action”, Manning Publications Co., NY, USA,2020.

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1. <https://www.rapid7.com/fundamentals/web-application-security/>
2. https://owasp.org/www-community/api_security_tools
3. <https://owasp.org/>
4. <https://www.veracode.com/security/vulnerability-assessment-and-penetration-testing>
5. <https://www.guru99.com/learn-everything-about-ethical-hacking-tools-and-skills.html>

Mapping of PO with CO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	3	3	2	-	-	-	2	2	-	3
CO-2	3	3	3	3	2	-	-	-	2	2	-	3
CO-3	3	2	3	3	2	-	-	-	2	2	-	3
CO-4	3	3	3	3	2	-	-	-	2	2	-	3
CO-5	3	1	3	3	3	1	-	2	2	2	-	3
Avg	3	2.4	3	3	2.2	-	-	2	2	2	-	3

JIT2006	MERN STACK DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To introduce the basics of JavaScript and importance of MERN stack.
- To identify the role of React in designing front-end components.
- To familiarize the design issues in the development of backend components using Node.js and Express.
- To illustrate the significance of using MongoDB as a database system.
- To make understand the advanced features of full stack development.

UNIT I JAVASCRIPT AND BASICS OF MERN STACK

9

JavaScript Fundamentals -Modules -DOM tree -Node properties -browser events -Events - Forms, controls -Document and resource loading -Mutation observer -Event loop -MERN Components.

UNIT II REACT

9

React ES6 -React Render HTML -React JSX -Components -React Classes - Composing Components -Passing Data -Dynamic Composition -React state - setting State -Async State Initialization - Event Handling -Stateless Components -Designing components-React Forms - React CSS -React SaaS.

UNIT III NODE.JS AND EXPRESS

9

Node.js basics -Node Package Manager -Node.js web server -Node.js File system -Node Inspector
-Node.js Event Emitter -Frameworks for Node.js -Express.js Web App -Node.js Data Access - Express REST APIs -REST -Resource Based -HTTP Methods as Actions -JSON-Express - Routing -Handler Function -Middleware -List and Create API -Automatic Server Restart -Error Handling -Template Engine.

UNIT IV MONGODB

9

MongoDB -MongoDB Basics -Documents -Collections -Query Language - Installation- The mongo Shell -MongoDB Node.js Driver -Reading from MongoDB -Writing to MongoDB - CRUD operations -projections -Indexing - Aggregaton -Replication -Sharding -Creating backup – Deployment.

UNIT V ADVANCED FEATURES

9

Modularization and Webpack -Routing with React Router -Forms -More Filters in the List API - UI Components -React-Bootstrap -Table and Panel -Forms - Alerts -Modals -Server Rendering - Basic Server Rendering -Handling State - MongoDB Aggregate -Pagination -Higher Order Components -Search Bar - Google Sign-In -Session Handling.

TOTAL : 45 PERIODS

COURSE OUTCOME:

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

- Discuss the basic concepts of javascript and MERN
- Build programs and applications using REACT
- Create applications using Node.Js and Express
- Apply MongoDB for database access.
- Explain what future enhancements are available for MERN stack.

TEXT BOOKS

1. Vasan Subramanian , “Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node” , APress Publisher, 2019.
2. Eric Bush, “Node.Js, Mongodb, React, React Native Full-Stack Fundamentals and Beyond”, Blue Sky Productions Incorporated, 2018.

REFERENCES

1. Manu Sharma , “Full Stack Development with MongoDB”, BPB publication, 2022.
2. Greg Lim , “Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App” , Independent publication, 2021.
3. Chris Northwood , “The Full Stack Developer Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer”, APress Publisher 2018

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2. <https://reactjs.org/>
3. <https://nodejs.org>
4. www.Expressjs.com
5. www.mongodb.com

Mapping of PO with CO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	1	3	3	3	-	-	-	2	2	-	3
CO-2	3	2	3	3	3	-	-	-	2	2	-	3
CO-3	3	3	3	3	3	-	-	-	2	2	-	3
CO-4	3	2	3	3	3	-	-	-	2	2	-	3
CO-5	3	2	3	3	3	-	-	-	2	2	-	3
Avg	3	2	3	3	3	-	-	-	2	2	-	3

JIT2007	SOFTWARE TESTING AND AUTOMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics of software testing
- To learn how to do the testing and planning effectively
- To build test cases and execute them
- To focus on wide aspects of testing and understanding multiple facets of testing
- To get an insight about test automation and the tools used for test automation

UNIT I FOUNDATIONS OF SOFTWARE TESTING

9

Why do we test Software?, Software Testing Life Cycle, V-model of Software Testing, Software Testing Principles, The Tester's Role in a Software Development Organization – Basic definitions-Failures, Errors and Faults, Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design

UNIT II TEST CASE DESIGN STRATEGIES

9

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing– Using White Box Approach to Test design– static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – – Paths – code complexity testing

Unit-III

Levels of Testing

9

The need for Levels of Testing – Unit Test – Unit Test Planning –The Test Harness – Integration tests – Designing Integration Tests – Integration Test Planning, System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Usability and Accessibility testing

UNIT IV TEST PLANNING & TEST AUTOMATION

9

The Goal of Test Planning- High Level Expectations- Intergroup Responsibilities- Test Phases, Test Strategy- Software test automation – skills needed for automation – scope of automation – design and architecture for automation – challenges in automation

UNIT V TEST AUTOMATION TOOLS

9

Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

TOTAL : 45 PERIODS

COURSE OUTCOMES

- Understand the basic concepts of software testing and the need for software testing
- Design Test planning and different activities involved in test planning
- Design effective test cases that can uncover critical defects in the application
- Carry out advanced types of testing
- • Automate the software testing using Selenium and TestNG

TEXTBOOKS

1. Yogesh Singh, “Software Testing”, Cambridge University Press, 2012
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" - Second Edition 2018

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1. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing
3. Paul C. Jorgensen, Software Testing: A Craftsman’s Approach, Fourth Edition, 2014, Taylor & Francis Group.
4. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
5. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
6. Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packt Publishing.
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MAPPING OF PO WITH CO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	2	1	2	-	-	-	1	1	3	2
CO-2	2	3	1	1	1	-	-	-	2	2	1	2
CO-3	2	2	1	3	1	-	-	-	1	3	1	2
CO-4	2	1	3	2	1	-	-	-	1	1	1	2
CO-5	2	2	1	3	1	-	-	-	1	3	2	1
Avg	2.2	2.2	1.6	2	1.2	-	-	-	1.2	2	1.6	1.8

JIT2008	NoSQL DATABASE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To describe the basics of NoSQL

- To make understand the features of RDBMS and NoSQL
- To familiarize the concept of Document oriented NoSQL Database.
- To help the students understand how store and access data column oriented databases
- To explain the usage of key value pair NoSQL database.

UNIT I BASICS OF NOSQL

9

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT II RDBMS AND NOSQL

9

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding,

UNIT III DOCUMENT ORIENTED NOSQL DB

9

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT IV COLUMN ORIENTED NOSQL DB

9

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event

Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT V KEY VALUE PAIR NOSQL DB

9

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Database. Features, Suitable Use Cases.

TOTAL : 45 PERIODS

COURSE OUTCOME:

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

- Discuss basic concepts of NoSQL databases.
- Explain the similarities and contrasts of RDBMS with different NoSQL databases.
- Explain the detailed architecture and performance tune of Document-oriented NoSQL databases.
- Analyze problems and use column oriented databases when necessary.
- Build efficient Key-Value Pair NoSQL databases.

TEXT BOOKS

1. Martin Fowler , Pramod Sadalage, “NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications”, 1st Edition ,2014.
2. Dan Sullivan Sullivan , “NoSQL for Mere Mortals”, Wesley Publication ,1st Edition, 2015

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1. Adam Fowler, “NoSQL For Dummies” , For dummies publication , 2015.
2. Shashank Tiwari , “Professional NoSQL”, Wiley publication 2011.
3. Gaurav Vaish, “Getting Started with NoSQL” , Packet publishing Limited, 2013.
4. Olivier Pivert , “NoSQL Data Models: Trends and Challenges” , Wiley publication, 2018
5. Dan McCreary, Ann Kelly, “Making Sense of NoSQL: A guide for managers and the rest of us”, Manning Publications, 2013.

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2. <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
3. <https://www.geeksforgeeks.org/introduction-to-nosql/>
4. <https://www.javatpoint.com/nosql-database>
5. <https://www.couchbase.com/resources/why-nosql/>

Mapping of PO with CO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	1	1	1	2	-	-	-	2	2	-	3
CO-2	3	1	3	1	2	-	-	-	2	2	-	3
CO-3	3	1	3	1	2	-	-	-	2	2	-	3
CO-4	3	1	3	1	2	-	-	-	2	2	-	3
CO-5	3	1	3	1	2	-	-	-	2	2	-	3
Avg	3	1	2.6	1	2	-	-	-	2	2	-	3

VERTICAL IV - CYBER SECURITY

JCB2001	CYBER SECURITY FUNDAMENTALS AND PRACTICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the difference between threat, risk, attack, and vulnerability.
- To learn about security in operating system and networks.
- To analyze the different security available in databases.
- To understand the concept of privacy and security in emerging technologies.
- To learn about management and risks in different technologies.

PREREQUISITE:

- Computer Programming
- Computer Networks

UNIT-I INTRODUCTION TO CYBER SECURITY

9

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication - Access Control and Cryptography –Web-User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks

UNIT-II SECURITY IN OPERATING SYSTEM & NETWORKS

9

Security in Operating Systems - Security in the Design of Operating Systems – Root kit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT-III DEFENCES SECURITY COUNTER MEASURES

9

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity
- Database Disclosure - Data Mining and Big Data.

UNIT-IV PRIVACY IN CYBERSPACE

9

Privacy concepts –privacy principles and policies -authentication and privacy-Data mining – privacy on the Web - email Security - privacy Impacts of Emerging Technologies - where the Field Is Headed.

UNIT-V MANAGEMENT AND INCIDENTS

9

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Classify various types of attacks and learn the tools to launch the attacks
- Apply various tools to perform information gathering
- Analyze intrusion techniques to detect intrusion
- Apply intrusion prevention techniques to prevent intrusion
- Explain the basics of cyber security, cyber crime and cyber law

TEXT BOOKS:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition, Pearson Education, 2015.
2. David Kim & Michael G. Solomon, “FOUNDATIONS” and Custom Edition 1 Jan 1, 2014.

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1. George K.Kostopoulos, Cyber Space and Cyber Security, CRC Press, 2013.
2. MarttiLehto, PekkaNeittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
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- <https://www.javatpoint.com/cyber-security-tutorial>
- <https://www.edureka.co/blog/cybersecurity-fundamentals-introduction-to-cybersecurity/>
- https://cnitarot.github.io/courses/fc_Fall_2022/2550_intro_history_pub_cnr.pdf

CO-PO MAPPINGS:

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

JCB2002	CRYPTOGRAPHY AND CRYPTANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To study about the fundamentals of Cryptography
- To analyze Key Management techniques and importance of number Theory
- To understand the concept of Message Authentication Codes and Hash Functions
- To design a security solution for a given application
- To understand about cyber crimes and the different security practice.

PREREQUISITE:

Fundamentals of Mathematics

UNIT-I INTRODUCTION TO CRYPTOGRAPHY

9

Number theory – Algebraic Structures – Modular Arithmetic - Euclid's algorithm – Congruence and matrices – Group, Rings, Fields, Finite Fields-Symmetric Key Ciphers- DES – Block Ciphers – DES – Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Pseudorandom Number Generators – RC4 – Key distribution.

UNIT-II ASYMMETRIC CRYPTOGRAPHY

9

Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem – Chinese Remainder Theorem – Exponentiation and logarithm-Asymmetric Key Ciphers - RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve arithmetic – Elliptic curve cryptography.

UNIT-III MESSAGE AUTHENTICATION AND HASH FUNCTION

9

Authentication Requirements - Authentication Function- Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs- Secure Hash Algorithm - Whirlpool, HMAC, CMAC -Digital Signatures - Authentication Protocol - Digital Signature Standard- Authentication Applications- Kerberos -X.509 Authentication Service - Public-key infrastructure

UNIT-IV FIREWALLS AND CRYPTANALYSIS

9

Intruder – Intrusion detection system -Password Management-Virus and related threats-Countermeasures- Firewall design principles- Trusted systems -Practical implementation of cryptography and security

UNIT-V CYBER CRIMES AND SECURITY

9

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods – Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of networks security
- Demonstrate the different cryptographic operations of symmetric cryptographic algorithms
- Develop the different cryptographic operations of public key cryptography.
- Explain the various Authentication schemes to simulate different applications.
- Understand various cyber-crimes and cyber security.

TEXT BOOKS:

1. Forouzan Mukhopadhyay “Cryptography and Network Security” McGraw Hill, 2nd Edition
2. William Stallings, "Cryptography and Network Security - Principles and Practice", Seventh Edition, Pearson Education, 2017.
3. Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cyber-crimes, Computer Forensics and Legal Perspectives”, First Edition, Wiley India, 2011.

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1. Behrouz A. Forouzan, DebdeepMukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata McGraw Hill, 2015.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

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- https://developer.mozilla.org/en-US/docs/Web/API/Web_Crypto_API
- <https://www.garykessler.net/library/crypto.html>
- <https://www.cryptomathic.com/news-events/blog/summary-of-cryptographic-algorithms-according-to-nist>

CO-PO MAPPINGS:

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

JCB2003	CYBER FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the process of Digital Cyber Forensics.
- To be aware of the Cyber forensics Environments and standards.
- To study the data and evidence collection activities.
- To understand how to investigate digital evidence.
- To Explore advanced techniques in Cyber Forensics.

PREREQUISITE:

Cryptography and Cryptanalysis

UNIT-I DIGITAL FORENSICS PROCESS 9

Computer forensic fundamentals - Applying forensic science to computers - Computer forensic services - Benefits of professional forensic methodology -Steps taken by computer forensic specialists, Forensic science, Digital forensics, Digital evidence, Digital forensics process – Identification, Collection, Examination, Analysis, Presentation Phases, Cyber Crime Law.

UNIT-II FORENSICS ENVIRONMENTS & STANDARDS 9

Hardware and software environments – Storage devices - Operating system - File Systems – Metadata - Locating evidence in file systems - Password security – Encryption - Hidden files - Digital evidence.

UNIT-III DATA AND EVIDENCE COLLECTION 9

Identification of Data: timekeeping - Forensic identification - Analysis of technical surveillance devices - Reconstructing past events - Useable file formats - Unusable file formats - Converting files - Investigating network intrusions - Cyber crime - Network forensics - Investigating logs - Network.

UNIT-IV INVESTIGATING DIGITAL EVIDENCE 9

Applying forensic Science to computers – Preparation – Survey – Documentation – Preservation – examination – Reconstruction - Analyzing digital evidence - Locating digital evidence, Categorizing files - Eliminating superfluous files - Event analysis tool - Cloud analysis tool - Lead analysis tool - Volume shadow copy analysis tools.

UNIT-V ADVANCED CYBER FORENSICS 9

Windows forensics evidence collection in linux - Network forensics packet capture using wire shark, t shark and tcp dump - Memory forensics virtual machine- Forensics use - Implementation -Virtual machines in forensic analysis- Cloud forensics analysis -Cloud storage - Data remnants.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Identify the need for cybercrime forensics.
- Examine the hardware, software components and standards responsible for seeking evidence.
- Apply techniques for collecting data and evidences.
- Analyze the methods for investigating digital evidences
- Examine advanced techniques for Cyber Forensics.

TEXT BOOKS:

1. Richard Boddingtons, Practical Digital Forensics, PACKT publishing, First Edition, 2016
ANDRÉ ÅRNES.
2. Marjie T.Britz, Computer Forensics and Cyber Crime: An Introduction, Third Edition, Prentice Hall, 2013

REFERENCES:

1. Richard E.Smith, “Internet Cryptography”, Third Edition, Pearson Education, 2008
2. Angus M.Marshall, “Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008.
3. John R.Vacca, “Computer Forensic”s, Second Edition, Cengage Learning, 2005.
4. John R. Vacca, Charles River Media “Computer Forensics: Computer Crime Scene Investigation”, 2nd Edition, , 2005

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- <https://www.geeksforgeeks.org/cyber-forensics/>
- <https://www.studocu.com/in/document/dr-babasaheb-ambedkar-marathwada-university/cyber-forensic/cyber-forensics-lecture-notes/34989994>
- <https://www.studocu.com/in/document/kannur-university/network-forensics/cyber-forensics-unit1/17233533>

CO-PO MAPPINGS:

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

JCB2004	INTRUSION DETECTION AND PREVENTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand basic concepts of intrusion detection system.
- To learn about Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.
- To analyze intrusion detection alerts and logs to distinguish attack types from false alarms
- To understand Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.
- To learn agent development for intrusion detection and architectural models of IDs and IPs.

PREREQUISITE:

Foundations of Cyber Security

UNIT-I INTRODUCTION TO INTRUSION DETECTION 9

History of intrusion detection, Audit, Concept and definition, Internal and external threats to data, Attacks, Need and types of IDS, Information sources, Host based information sources, Network based information sources.

UNIT-II THEORITICAL FOUNDATION OF DETECTION 9

Intrusion prevention systems, Network Ids protocol based Ids, Hybrid Ids, Analysis schemes, Thinking about intrusion, Model for intrusion analysis, Techniques responses, Requirement of responses, Types of responses, Mapping responses to policy vulnerability analysis, Credential analysis, Non credential analysis

UNIT-III ARCHITECTURE AND IMPLEMENTATION 9

Introduction to snort, Snort installation scenarios, Installing snort , Running snort on multiple network interfaces, Snort command line options, Step-by-step procedure to compile ,Install snort location of snort files, Snort modes snort alert modes

UNIT-IV SNORT CONCEPTS 9

Working with snort rules, Rule headers, Rule options, Snort configuration file,Plugins, Preprocessors and output modules, Using snort with mysql

UNIT-V CASE STUDY 9

Using ACID and snort snarf with snort, Agent development for intrusion detection, Architecture models of Ids and Ips

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the basic concepts of intrusion detection system.
- Explain about Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.
- Analyze when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.
- Understand the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.
- Explain about agent development for intrusion detection and architectural models of IDs and IPs.

TEXT BOOK:

1. T. Fahringer, R. Prodan, “A Text book on Grid Application Development and Computing Environment”. 6th Edition, Khanna Publishers, 2012
2. Rafeeq Rehman : “ Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID,” 1st Edition, Prentice Hall , 2003

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1. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: “Intrusion Detection and Correlation Challenges and Solutions”, 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander “ Intrusion Detection & Prevention”, 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak: “Network Intrusion Detection”, 3rd Edition, New Riders Publishing, 2002.

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- <https://www.helixstorm.com/blog/types-of-intrusion-detection-systems/>
- <https://usemynotes.com/what-is-intrusion-detection-system/>
- <https://www.cs.colostate.edu/~massey/Teaching/cs356/RestrictedAccess/Slides/356lecture18.pdf>

CO-PO MAPPINGS:

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

JCB2005	HARDWARE SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know basic components and fundamentals of hardware security.
- To develop an application using various services in security.
- To understand about different attacks and testing.
- To learn the basic and important concepts of hardware design.
- To understand the issues and solutions for hardware security and monitoring.

PREREQUISITE:

Cryptography and Cryptanalysis

UNIT-I INTRODUCTION

9

Hardware security-Key threats-Security practices-Types-Fault attacks and countermeasures-Hardware design cycle-Measuring hardware security-Secure platforms-Ciphers: historical; block (AES/DES), Stream, (Trivium) Public Key Ciphers (RSA, ECC), Hash Functions (SHA-1)

UNIT-II PRINCIPLES AND APPLICATIONS

9

Physical unclonable functions:-Design-Principles and applications- Hardware random- Number generators: design-Principles and applications-Design and evaluate pufs - Random number generators on an FPGA

UNIT-III ATTACKS AND TESTING

9

Side channels – Overview - Fault attacks and countermeasures Power attacks and countermeasures - Designing Fault attack - Evaluate a counter measure - VLSI testing: attacks and countermeasures, Scan attack on FPGA implementation of DES.

UNIT-IV HARDWARE ARCHITECTURE

9

Hardware trojans-Overview-Attacks and defenses-Malicious 8051 Processor design-IP piracy- Logic encryption-FPGA logic encryption of combinational logic-Reverse engineering: ic layout camouflaging, Gate level reversing, ESL reversing.

UNIT-V CASE STUDY

9

Analysis of notable hardware security breaches - Study of hardware security vulnerabilities in commercial systems-Emerging hardware security technologies – Approaches - Ethical considerations - Hardware security research - Practice- Internet of Things (IoT) Security challenges- Hardware security - Autonomous systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate the main concepts of security, its characteristics, advantages, key technologies.
- Develop and design an application using various tools in hardware environment.
- Understand the basic and important design concepts and issues of attacks and testing.
- Explain about the concept, characteristics and the architecture of hardware.
- Analyze the issue of security and understand the applications of hardware security in various fields.

TEXT BOOK:

1. S. Bhunia and M. Tehranipoor, “Hardware Security: A Hand-on Training Approach, Morgan Kauffman”, 2018
2. M. Tehranipoor and C. Wang (Eds.), Introduction to Hardware Security and Trust, Springer, 2011

REFERENCES:

1. Debdeep Mukhopadhyay, “Hardware Security: Design, Threats, and Safeguards”, 1st edition, 2015.
2. Mohammad Tehranipoor and Cliff Wang, “Introduction to Hardware Security and Trust, by”, kindle edition, 2012.

WEB REFERENCES:

- <https://www.amazon.in/Introduction-Hardware-Security-Mohammad-Tehranipoor-ebook/dp/B00F5U36X8>
- https://books.google.com/books/about/Introduction_to_Hardware_Security_and_Tr.html?id=bNiw9448FeIC
- <https://tehranipoor.ece.ufl.edu/wp-content/uploads/2021/07/01-Intro-to-HW-Security.pdf>
- https://catalog.library.vanderbilt.edu/discovery/fulldisplay/alma991043664639603276/01VAN_INST:vanui

CO-PO MAPPINGS:

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

JCB2006	CLOUD SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know basic components and fundamentals of cloud computing.
- To develop an application using various services in cloud.
- To understand how to design the web application development in cloud.
- To understand the issues and solutions for cloud security and cloud monitoring.
- To learn the basic and important concepts of python to implement in an application.

PREREQUISITE:

- Data Communication and Networking
- Foundations of Cyber Security

UNIT-I INTRODUCTION

9

Cloud fundamentals - Cloud service components - Cloud service, Deployment models - Cloud components - Guiding principle - Utilization, Security, Pricing - Application of cloud computing. Case Study: Open stack and AWS.

UNIT-II CLOUD BASED APPLICATIONS DEVELOPMENT

9

Application architectures- Monolithic-Distributed, Micro Service fundamental - Cloud native applications - 12 factors app - Application integration process - APIfication process- API fundamental-Micro service - API management- Spring boot fundamental - Design of micro service- API tools.

UNIT-III WEB DEVELOPMENT TECHNIQUES

9

Devops fundamentals - Devops role – responsibility - Tools - Containerization process and application-Evolution of app deployment- Docker fundamentals – architecture – Commands – Orchestration – Kubernetes - Docker container.

UNIT-IV CLOUD SECURITY AND MONITORING TOOL

9

Cloud security- Shared responsibility architecture - Security by design principles-Identity - Access management - Cloud security layers illustration - Cloud network - Host - Data security concepts - Security operations - Major cloud service provider tools - Security compliance and regulations - Cloud monitoring - Benefits of cloud monitoring.

UNIT-V BUILDING AN APPLICATION USING PYTHON

9

Developing - Deploying an application in the cloud- Building a python project based on design - Development testing - Deployment of an application using a development framework - Deployment Platform - Case study: python use case and python framework.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models.
- Develop and design an application using various tools in cloud environment.
- Acquire the basic and important design concepts and issues of web application development techniques in cloud.
- Structure simple python program for developing an application in cloud.
- Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud monitoring.

TEXT BOOK:

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", Prentice Hall, 2013.
2. Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press, 2012.

REFERENCES:

1. Michael J. Kavis "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)", 1st Edition, Wiley, 2014.
2. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
3. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011

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- https://www.tutorialspoint.com/cloud_computing/cloud_computing_security.htm
- <https://www.javatpoint.com/what-is-cloud-security>
- <https://www.ibm.com/topics/cloud-security>
- <https://www.box.com/resources/what-is-cloud-security>
- <https://cloud.google.com/learn/what-is-cloud-security>

CO-PO MAPPINGS:

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

JCB2007	ETHICAL HACKING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To study about the fundamentals of hacking.
- To learn different types of hacking in web.
- To understand attacks in networking.
- To learn about wireless hacking, attacks and various agents in hacking.
- To understand about automation and authentication.

PREREQUISITE:

- Cryptography and Cryptanalysis

UNIT-I INTRODUCTION TO HACKING

9

Introduction to hacking – Terminologies – Penetration test – Vulnerability assessments versus penetration test – Pre-engagement – Rules of engagement – Penetration testing methodologies – OSSTMM – Categories of penetration test – Types of penetration tests – Vulnerability assessment summary -Reports.

UNIT-II ETHICAL HACKING IN WEB

9

Introduction to ethical hacking – Foot printing - Reconnaissance - Scanning networks - Enumeration - System hacking - Malware Threats – Sniffing- Social engineering - Denial of service - Session hijacking - Hacking web servers - Web applications – SQL Injection - Hacking wireless networks - Mobile platforms.

UNIT-III NETWORK ATTACKS

9

Vulnerability data resources – Exploit databases –Promiscuous versus non promiscuous mode – MITM attacks – ARP attacks –SSL strip: stripping https traffic -DNS spoofing – ARP spoofing– DHCP Spoofing -Remote exploitation – Attacking network remote services – Overview of brute force attacks.

UNIT-IV WIRELESS HACKING

9

Wireless hacking – Air crack- Cracking WEP – WPA/WPA2 wireless network using air crack – Evil twin attack –Log-in protection mechanisms – Captcha validation flaw – Captcha RESET flaw Manipulating user-Agents to bypass captcha.

UNIT-V CASE STUDY

9

Authentication bypass attacks – Testing for vulnerability – Automating with burp suite – Sessionattacks – SQL injection attacks – XSS (Cross-Site Scripting) - Types of cross-Site scripting – Cross-site request forgery (CSRF) – SSRF attacks.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of hacking and different methodologies in testing.
- Demonstrate the different types of hacking and various applications in web.
- Explain about different attacks, testing, and authentication in networking.
- Understand about wireless hacking, cracking and protection mechanisms.
- Explain the various Authentication schemes to simulate different applications.

TEXT BOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2016.
2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.

REFERENCES:

1. Marjie T.Britz, "Computer Forensics and Cyber Crime: An Introduction", 3rd Edition, Prentice Hall, 2013.
2. Kenneth C.Brancik, "Insider Computer Fraud", Auerbach Publications Taylor & Francis Group-2008.
3. Ankit Fadia, "Ethical Hacking", Second Edition, Macmillan India Ltd, 2006
4. John R.Vacca, "Computer Forensics", Cengage Learning, 2005

WEB REFERENCES:

- <https://www.geeksforgeeks.org/introduction-to-ethical-hacking/>
- https://www.hackittech.com/Resources%20pdf/hacking_resources/HackitTech_20210523130501.pdf
- <https://www.javatpoint.com/ethical-hacking>
- <https://www.synopsys.com/glossary/what-is-ethical-hacking.html>
- <https://www.knowledgehut.com/blog/security/introduction-to-ethical-hacking>

CO-PO MAPPINGS:

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

JCB2008	WEB APPLICATION SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To reveal the underlying in web application.
- To identify and aid in fixing any security vulnerabilities during the web development process.
- To understand the security principles in developing a reliable web application.
- To learn about different industry tools in web security.
- To understand about various testing and security.

PREREQUISITE:

- Web Technology

UNIT-I INTRODUCTION TO WEB APPLICATIONS 9

History of web applications interface -Web application Vs Cloud application -Security fundamentals- Input validation - Attack surface reduction rules of thumb- Classifying and prioritizing threats

UNIT-II WEBAPPLICATION SECURITY FUNDAMENTALS 9

Origin policy - Exceptions to the same- Cross-site scripting and cross-site request forgery – Reflected XSS - HTML injection

UNIT-III WEB APPLICATION VULNERABILITIES 9

Vulnerabilities in traditional client server application and web applications- Client state manipulation-Cookie based attacks, -SQL injection, Cross domain attack (XSS/XSRF/XSSI) -Http header injection - SSL vulnerabilities and testing - Proper encryption use in web application- Session vulnerabilities and testing -Cross-site request forgery.

UNIT-IV WEB APPLICATION MITIGATIONS 9

Http request-Http response, rendering and events-Html image tags-Image tag security-Issue -Java script on error-Java script timing- Port scanning-Remote scripting-Running remote code -frame and iframe-Browser sandbox-policy goals, same origin policy-Library import-Domain relaxation

UNIT-V SECURE WEBSITE DESIGN 9

Introduction-Architecture and Design Issues for Web Applications –Deployment Considerations Input Validation–Authentication–Authorization-ConfigurationManagement-Sensitive Data- Session Management – Cryptography - Parameter Manipulation - Exception Management.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Identify the vulnerabilities in the web applications.
- Identify the various types of threats and mitigation measures of web applications.
- Apply the security principles in developing a reliable web application.
- Use industry standard tools for web application security.
- Apply Penetration testing to improve the security of web application

TEXT BOOKS:

1. Sullivan, Bryan and Vincent Liu. Web Application Security, A Beginner's Guide .McGraw Hill Professional, 2011.
2. Stuttard, Dafydd and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws. John Wiley Sons, 2011

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1. Behrouz A. Ferouzan, DebdeepMukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata McGraw Hill, 2015.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

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- Web Application Security: Exploitation and Counter measures for Modern Web...- Andrew Hoffman
- Google Booksamazon.com/Web-Application-Security-Beginners-Guide/dp/0071776168
- <https://www.garykessler.net/library/crypto.html>
- <https://www.cryptomathic.com/news-events/blog/summary-of-cryptographic-algorithms-according-to-nist>

CO-POMAPPINGS:

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

GAMING TECHNOLOGY USING AI

JAD2009	AI FOR GAMES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamental concepts and principles of artificial intelligence as applied to game development.
- To learn various algorithms and techniques used in game AI, including pathfinding, decision-making, and behavior trees.
- To develop practical skills in designing and implementing intelligent agents for game environments.
- To explore the integration of AI systems into different game genres and platforms.
- To examine the ethical considerations and challenges associated with AI in games.

UNIT-I : INTRODUCTION TO GAME AI

9

Overview of AI in games - History and evolution of game AI -Challenges and opportunities in game AI development - AI Fundamentals: Search algorithms and pathfinding -State-based systems and finite state machines -Decision-making and utility theory - Uncertainty and probability in game AI.

UNIT-II : BEHAVIORAL AI

9

Introduction to behavior trees - Finite state machines vs. behavior trees - Designing and implementing AI behaviors - Combining behaviors and priorities-Pathfinding and Navigation: A* algorithm and variations - Grid-based and graph-based pathfinding -Dynamic pathfinding and obstacle avoidance - Navigation meshes and waypoint systems.

UNIT-III : DECISION-MAKING AND PLANNING

9

Rule-based systems - Markov decision processes - Goal-oriented action planning- Hierarchical task networks - Learning and Adaptive AI : Introduction to machine learning in games - Reinforcement learning for game AI - Neural networks and deep learning for game AI - Training AI agents with genetic algorithms.

UNIT-IV : AI FOR GAME GENRES

9

AI for first-person shooters - AI for strategy games - AI for role-playing games – puzzlegame

UNIT-V : ETHICAL CONSIDERATIONS IN GAME AI

Bias and fairness in AI systems - Player experience and balancing AI difficulty - Privacy and data handling in AI-powered games - Social and cultural impacts of game AI.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 : Demonstrate a solid understanding of AI concepts and their application in game development.
- CO2 : Design and implement intelligent agents with appropriate decision-making capabilities.
- CO3 : Apply pathfinding algorithms to create efficient navigation for game characters.
- CO4 : Evaluate and optimize AI systems for performance and effectiveness. CO5 : Analyze and discuss ethical considerations related to AI in games.

TEXT BOOKS:

1. Ian Millington and John Funge, "Artificial Intelligence for Games", CRC Press, 2009.
2. Mat Buckland, "Programming Game AI by Example", Mercury Learning and Information, 2019.

REFERENCES:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson, 2016.
2. Dave Mark, "Behavioral Mathematics for Game AI", CRC Press, 2009.
3. Steve Rabin, "Game AI Pro: Collected Wisdom of Game AI Professionals", A K Peters/CRC Press, 2013.
4. Charles River Media, "AI Game Programming Wisdom", Charles River Media, 2002.

WEBSITE REFERENCES :

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2. <https://www.youtube.com/watch?v=WkCLRUWA3lk>
3. <https://builtin.com/artificial-intelligence/ai-games>
4. <https://www.youtube.com/watch?v=NPuYtHZud0o>

CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	-	1	-	-	-	1	2
CO2	2	2	3	3	2	-	1	-	-	-	2	2
CO3	3	3	3	1	2		1	-	-	-	2	2
CO4	3	3	3	1	2	-	1	-	-	-	2	3
CO5	3	1	2	1	2	-	1	-	-	-	2	2
AVG	2.6	2.2	2.8	1.8	2	0	1	0	0	0	1.8	2.2

JAD2010	GAME THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory, and the main applications for which they are appropriate, including electronic trading markets
- To formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in modelling applications
- To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues.
- To introduce contemporary topics in the intersection of game theory, computer science, and economics.
- To apply game theory in searching, auctioning and trading.

UNIT-I INTRODUCTION

9

Introduction – Making rational choices: basics of Games – strategy – preferences – payoffs – Mathematical basics – Game theory – Rational Choice – Basic solution concepts-non- cooperative versus cooperative games – Basic computational issues – finding equilibria and learning in games Typical application areas for game theory (e.g. Google’s sponsored search, eBay auctions, electricity trading markets).

UNIT-II GAMES WITH PERFECT INFORMATION

9

Games with Perfect Information – Strategic games – prisoner’s dilemma, matching pennies – Nash equilibria – theory and illustrations – Cournot’s and Bertrand’s models of oligopoly – auctions – mixed strategy equilibrium – zero-sum games – Extensive Games with Perfect Information – repeated games (prisoner’s dilemma) – subgame perfect Nash equilibrium; computational issues.

UNIT-III GAMES WITH IMPERFECT INFORMATION

9

Games with Imperfect Information – Bayesian Games – Motivational Examples – General Definitions – Information aspects – Illustrations – Extensive Games with Imperfect – Information – Strategies – Nash Equilibrium – Beliefs and sequential equilibrium – Illustrations – Repeated Games– The Prisoner’s Dilemma – Bargaining.

UNIT-IV NON-COOPERATIVE GAME THEORY

9

Non-cooperative Game Theory – Self-interested agents – Games in normal form – Analyzing games- from optimality to equilibrium – Computing Solution Concepts of Normal – Form Games – Computing Nash equilibria of two-player, zero-sum games –Computing Nash equilibria of twoplayer, generalsum games – Identifying dominated strategies.

UNIT-V MECHANISM DESIGN

9

Aggregating Preferences – Social Choice – Formal Model – Voting – Existence of social functions – Ranking systems – Protocols for Strategic Agents: Mechanism Design – Mechanism design with unrestricted preferences – Efficient mechanisms – Vickrey and VCG mechanisms (shortest paths) – Combinatorial auctions – profit maximization Computational applications of mechanism design – applications in Computer Science – Google’s sponsored search – eBay auctions – K-armed bandits.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

- Discuss the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts.
- Discuss the use of Nash Equilibrium for other problems.
- Identify key strategic aspects and based on these be able to connect them to appropriate game theoretic concepts given a real world situation.
- Identify some applications that need aspects of Bayesian Games.
- Implement a typical Virtual Business scenario using Game theory.

TEXT BOOKS

1. M. J. Osborne, An Introduction to Game Theory. Oxford University Press, 2004.
2. M. Machler, E. Solan, S. Zamir, Game Theory, Cambridge University Press, 2013.

REFERENCES

1. N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani (Editors), Algorithmic Game Theory. Cambridge University Press, 2007.
2. A. Dixit and S. Skeath, Games of Strategy, Second Edition. W W Norton & Co Inc, 2004.
3. Yoav Shoham, Kevin Leyton-Brown, Multiagent Systems: Algorithmic, Game- Theoretic, and Logical Foundations, Cambridge University Press 2008.
4. Zhu Han, Dusit Niyato, Walid Saad, Tamer Basar and Are Hjorungnes, "Game Theory in Wireless and Communication Networks", Cambridge University Press, 2012.
5. Y. Narahari, "Game Theory and Mechanism Design", IISC Press, World Scientific

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1. <https://www.geeksforgeeks.org/game-theory/>
2. <https://www.geeksforgeeks.org/game-theory-in-ai>

CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	-	1	-	-	-	1	2
CO2	2	2	3	3	2	-	1	-	-	-	2	2
CO3	3	3	3	1	2		1	-	-	-	2	2
CO4	3	3	3	1	2	-	1	-	-	-	2	3
CO5	3	1	2	1	2	-	1	-	-	-	2	2
AVG	2.6	2.2	2.8	1.8	2	0	1	0	0	0	1.8	2.2

JAD2011	REINFORCEMENT LEARNING FOR GAMES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study basics of reinforcement learning
- To study tabular methods and q-networks
- To study policy optimization in reinforce
- To study recent advances and applications in reinforcement learning
- To study case study of reinforcement learning

UNIT I FOUNDATIONS

9

Introduction and Basics of RL - Defining RL Framework and Markov Decision Process - Policies, Value Functions and Bellman Equations - Exploration vs. Exploitation - Code Standards and Libraries used in RL (Python/Keras/Tensorflow)

UNIT II TABULAR METHODS AND Q-NETWORKS

9

Planning through the use of Dynamic Programming and Monte Carlo - Temporal-Difference learning methods, SARSA, Q-Learning - Deep Q-networks (DQN, DDQN, Dueling DQN, Prioritised Experience Replay)

UNIT III POLICY OPTIMIZATION

9

Introduction to policy-based methods - Vanilla Policy Gradient - REINFORCE algorithm and stochastic policy search - Actor-critic methods (A2C, A3C) - Advanced policy gradient (PPO, TRPO, DDPG)

UNIT IV RECENT ADVANCES AND APPLICATIONS

9

Meta-learning - Multi-Agent Reinforcement Learning - Partially Observable Markov Decision Process - Ethics in RL - Applying RL for real-world problems, Recent advances in RL for games.

UNIT V CASE STUDIES

9

OpenAI Gym and RL environments – Deep RL for board games (eg., Chess, Go) – Real-Time strategy (RTS) games and RL.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand basics of reinforcement learning

CO2 : Understand the tabular methods and Q-networks.

CO3 : Learn the policy optimization

CO4 : Learn the recent advancements and applications in reinforcement learning.

CO5 : Understand the various case study of reinforcement learning.

TEXT BOOKS:

1. Reinforcement Learning: An Introduction - Sutton and Barto (2018)
2. Algorithms for Reinforcement Learning - Csaba Szepesvari (2010)

REFERENCES:

1. Neuro-Dynamic Programming - Bertsekas and Tsitsiklis (1996).
2. Reinforcement Learning: Industrial Applications of Intelligent Agents - Phil Winder (2020)
3. Deep Reinforcement Learning Hands-On - Maxim Lapan (2020)
4. Applying Reinforcement Learning on Real-World Data with Practical Examples in Python - Philip Osborne, Kajal Singh, Matthew Taylor (2022).

WEB REFERENCES:

1. <https://www.javatpoint.com/reinforcement-learning>
2. https://www.tutorialspoint.com/machine_learning_with_python/machine_learning_with_python_reinforcement_learning.htm
3. <https://towardsdatascience.com/how-to-teach-an-ai-to-play-games-deep-reinforcement-learning-28f9b920440a>

CO-PO AND CO-PSO MAPPING:.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	2	-	1	-	-	-	1	2		
CO2	2	2	3	3	2	-	1	-	-	-	2	2		
CO3	3	3	3	1	2	-	1	-	-	-	2	2		
CO4	3	3	3	1	2	-	1	-	-	-	2	3		
CO5	3	1	2	1	2	-	1	-	-	-	2	2		
AVG	2.6	2.2	2.8	1.8	2	0	1	0	0	0	1.8	2.2		

JAD2012	GAME DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamental principles and elements of game design.
- To develop skills in designing game mechanics, systems, and player progression.
- To explore narrative and storytelling techniques in games.
- To learn principles of game user interface (UI) and user experience (UX) design.
- To gain experience in playtesting, analyzing player feedback, and iterative design

UNIT-I : INTRODUCTION TO GAME DESIGN

9

Overview of Game Design Principles - History and Evolution of Game Design - Elements of Game Design: Mechanics, Dynamics, and Aesthetics - Role of Game Designers in the Game Development Process.

UNIT-II : GAME MECHANICS AND SYSTEMS

9

Understanding Game Mechanics and Rules - Core Mechanics and Emergent Gameplay - Balancing and Tuning Game Systems - Designing Player Progression and Rewards.

UNIT-III : NARRATIVE AND STORYTELLING IN GAMES

9

Importance of Narrative in Games - Storytelling Techniques and Structures - Player Agency and Interactive Storytelling - Integrating Gameplay and Narrative Elements.

UNIT IV-GAME USER INTERFACE AND USER EXPERIENCE

9

Principles of Game UI and UX Design - Interface Design and Usability - Visual Communication and Graphic Design in Games - Prototyping and Testing UI/UX Designs.

UNIT-V : GAME TESTING AND ITERATION

9

Playtesting and Gathering User Feedback - Iterative Design and Prototyping - Analyzing Player Behavior and Engagement - Balancing and Refining Gameplay Elements.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 : Demonstrate a solid understanding of game design principles and concepts. CO2 : Design and document game mechanics and systems.
- CO3 : Create compelling narratives and integrate them effectively into gameplay.
- CO4 : Design intuitive and visually appealing game UI/UX.
- CO5 : Apply playtesting and iterative design methods to refine and improve game designs.

TEXT BOOKS:

1. Jesse Schell, "The Art of Game Design: A Book of Lenses", CRC Press, 2008.
2. Tracy Fullerton, "Game Design Workshop: A Play centric Approach to Creating Innovative Games", CRC Press, 2014.

REFERENCES:

1. Brenda Brathwaite and Ian Schreiber , "Challenges for Game Designers", Cengage Learning, 2008.
2. Katie Salen and Eric Zimmerman , "Rules of Play: Game Design Fundamentals", MIT Press, 2003.
3. Scott Rogers , "Level Up! The Guide to Great Video Game Design", Wiley, 2014.

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1. <https://www.cgspectrum.com/blog/what-is-game-design>
2. <https://www.youtube.com/watch?v=G8AT01tuyrk>
3. <https://www.youtube.com/watch?v=PMXf0e8n2Oc>
4. https://www.youtube.com/watch?v=TOQTZ6N_eVg

CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	2	1					2	2
CO2	3	2	2	3	2	2					2	3
CO3	3	2	2	3	2	2					2	2
CO4	2	2	2	3	2	2					2	2
CO5	2	2	3	2	2	1					2	2
AVG	2.6	2	2	2.8	2	1.6	0	0	0	0	2	2.2

JAD2013	GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of game development processes and workflows.
- To gain practical skills in game design, prototyping, and documentation.
- To develop proficiency in game programming and implementation of gameplay mechanics.
- To learn game art principles and techniques for asset creation.
- To gain experience in game testing, optimization, and deployment.

UNIT-I : INTRODUCTION TO GAME DEVELOPMENT 9

Overview of Game Development Process - History and Evolution of Game Development
- Roles and Responsibilities in Game Development Teams - Introduction to Game Engines and Tools.

UNIT-II : GAME DESIGN AND PROTOTYPING 9

Fundamentals of Game Design - Conceptualizing and Documenting Game Ideas - Paper Prototyping and Iterative Design - Game Design Documentation and Communication.

UNIT-III : GAME PROGRAMMING AND DEVELOPMENT 9

Introduction to Game Programming Languages (e.g., C++, C#, Java) - Basics of Game Development Frameworks and APIs - Gameplay Programming and Mechanics Implementation
- Asset Integration and Game Polishing.

UNIT-IV : GAME ART AND ASSET CREATION 9

Principles of Game Art and Visual Design - 2D and 3D Asset Creation Techniques - Character Design and Animation - Environmental and Level Design.

UNIT-V : GAME TESTING, DEPLOYMENT, AND POST-PRODUCTION 9

Quality Assurance and Testing in Game Development - Playtesting and Gathering User Feedback -Game Optimization and Performance Tuning - Game Publishing and Distribution.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 :Demonstrate a comprehensive understanding of the game development process.
- CO2 :Design and prototype game ideas effectively.
- CO3 :Implement gameplay mechanics using programming languages and frameworks.
- CO4 :Create visually appealing game assets and environments.
- CO5 :Test, optimize, and deploy games for different platforms.

TEXT BOOKS:

1. Jesse Schell, "The Art of Game Design: A Book of Lenses", CRC Press, 2008.
2. Joe Hocking , "Unity in Action: Multiplatform Game Development in C#", Manning Publications, 2018.

REFERENCES:

1. Alan Thorn, "Game Development Principles", Wiley, 2018.
2. Mike McShaffry , "Game Coding Complete", Cengage Learning, 2018.
3. Jeremy Gibson Bond , "Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#" , Addison- Wesley Professional, 2017.

WEBSITE REFERENCES :

1. <https://www.youtube.com/watch?v=7C92ZCnlmQo>
2. <https://www.youtube.com/watch?v=U9vqzH65Zzw>
3. <https://developer.android.com/games/agde>
4. <https://www.youtube.com/watch?v=rJ1iA-33fss>

CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	3	1					2	2
CO2	3	2	1	2	2	1					2	1
CO3	3	2	2	2	2	1					2	2
CO4	3	2	1	2	1	1					2	3
CO5	2	2	1	2	2	1					2	2
AVG	2.8	2	2	2	2	1					2	2

JAD2014	USER INTERFACE DESIGN FOR GAMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamental principles and elements of user interface (UI) design for gaming.
- To develop skills in creating visually appealing and functional game UI.
- To learn interaction design techniques for intuitive and user-friendly game UI.
- To gain experience in prototyping, iterating, and testing game UI designs.
- To understand the process of implementing and integrating game UI into the game development pipeline.

UNIT-I INTRODUCTION TO USER INTERFACE DESIGN IN GAMES 9

Introduction to User Interface (UI) Design - Importance of UI in Gaming - Elements of Game UI: Menus, HUDs, Icons, Buttons, etc.- UI Design Principles and Best Practices.

UNIT-II : VISUAL DESIGN FOR GAME UI 9

Visual Communication in Game UI - Typography and Iconography in UI Design - Color Theory and Palette Selection - Creating Visual Consistency and Cohesion in Game UI .

UNIT-III : INTERACTION DESIGN FOR GAME UI 9

User Interaction and Feedback in Game UI - UI Flow and Navigation Design - Controls and Input Design for Different Platforms - Responsive UI Design and Adaptive Layouts.

UNIT-IV PROTOTYPING AND ITERATIVE DESIGN FOR GAME UI 9

Wireframing and Mockups for Game UI - Rapid Prototyping Techniques - Gathering User Feedback and Usability Testing - Iterative Design Process for Game UI Improvement.

UNIT-V UI IMPLEMENTATION AND INTEGRATION IN GAME DEVELOPMENT 9

Implementing UI Elements in Game Engines - Integration of UI Systems with Gameplay Mechanics - Optimizing Performance and Responsiveness of Game UI - Testing and Debugging UI for Different Devices and Platforms.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 :Demonstrate a solid understanding of UI design principles and concepts in the context of gaming.

CO2 :Design visually appealing and user-friendly game UI elements. CO3 : Develop interactive and responsive game UI systems.

CO4 :Apply iterative design methods to prototype, test, and refine game UI designs.

CO5 : Successfully integrate game UI into game development projects.

TEXT BOOKS:

- 1.Celia Hodent, "The Gamer's Brain: How Neuroscience and UX Can Impact Video Game Design", CRC Press, 2017.
- 2.Don Norman, "The Design of Everyday Things", Basic Books, 2013.

REFERENCES:

1. Everett N. McKay , "UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication" , Morgan Kaufmann, 2013.
2. Jenifer Tidwell , "Designing Interfaces: Patterns for Effective Interaction Design", O'Reilly Media, 2010.
3. William Lidwell, Kritina Holden, and Jill Butler, "Universal Principles of Design", Rockport Publishers, 2010.

WEBSITE REFERENCES :

2. <https://www.youtube.com/watch?v=sc3h5JXtIzw>
3. <https://www.sketch.com/blog/game-ui-design/>
4. <https://www.taskade.com/blog/user-interface-design-gaming-productivity/>
5. <https://www.youtube.com/watch?v=p7SlpT2GFGs>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	2		1			2	3
CO2	3	2	2	2	1	2		1			2	2
CO3	3	2	2	2	1	3					2	2
CO4	3	1	2	2	2	2					2	2
CO5	3	2	2	2	3	1					2	1
AVG	3	2	2	2.2	1.6	2	0	0.4	0	0	2	2

JCS2015	AUGMENTED REALITY/VIRTUAL REALITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to VR/AR
- Review the Geometric Modeling Techniques
- Review the Virtual Environment
- Discuss and Examine VR/AR Technologies
- Use of various types of Hardware and Software in Virtual Reality systems and it's applications.

UNIT-I INTRODUCTION TO VIRTUAL REALITY(VR)

9

Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

UNIT-II COMPUTER GRAPHICS AND GEOMETRIC MODELLING

9

The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

UNIT-III VIRTUAL ENVIRONMENT

9

Input/Output Devices: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Video based Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices) Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system
Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT-IV AUGMENTED REALITY(AR)

9

Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating ARsystems.

UNIT-V DEVELOPMENT TOOLS, FRAMEWORKS & APPLICATIONS

9

Human factors: Introduction, the eye, the ear, the somatic senses Hardware:

Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems

Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML.

AR / VR Applications: Introduction, Engineering, Entertainment, Science, Training, Game Development

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

- Understand fundamental Computer Vision, Computer Graphics and Human Computer Interaction Techniques related to VR/AR.
- Understand Geometric Modeling Techniques
- Understand the Virtual Environment
- Analyze and evaluate VR/AR Technologies
- Apply various types of Hardware, Software in Virtual Reality systems and Virtual/Augmented Reality Applications.

TEXT BOOKS

1. Coiffet, P., Burdea, G. C., (2003), “Virtual Reality Technology,” Wiley-IEEE Press
2. Schmalstieg, D., Höllerer, T., (2016), “Augmented Reality: Principles & Practice,” Pearson

REFERENCES

1. Craig, A. B., (2013), “Understanding Augmented Reality, Concepts and Applications,” Morgan Kaufmann,
2. Craig, A. B., Sherman, W. R., Will, J. D., (2009), “Developing Virtual Reality Applications, Foundations of Effective Design,” Morgan Kaufmann,
3. John Vince, J., (2002), “Virtual Reality Systems, “ Pearson,
4. Anand, R., “Augmented and Virtual Reality,” Khanna Publishing House
5. Kim, G. J., (2005), “Designing Virtual Systems: The Structured Approach”,
6. Bimber, O., Raskar, R., (2005), “Spatial Augmented Reality: Merging Real and Virtual Worlds,” CRC Press,
7. O'Connell, K., (2019), “Designing for Mixed Reality: Blending Data, AR, and the Physical World,” O'Reilly,
8. Sanni Siltanen, S., (2012), “Theory and applications of marker-based augmented reality,” Julkaisija –Utgivare Publisher.

WEBSITE REFERENCES

1. Manivannan, M., (2018), “Virtual Reality Engineering,” IIT Madras, <https://nptel.ac.in/courses/121106013>
2. Misra, S., (2019), “Industry 4.0: Augmented Reality and Virtual Reality,” IIT Kharagpur, <https://www.youtube.com/watch?v=zLMgdYI82IE>
3. Dube, A., (2020), “Augmented Reality - Fundamentals and Development,” NPTEL Special Lecture Series, <https://www.youtube.com/watch?v=MGuSTAqlZ9Q>
4. <http://cambum.net/course-2.html>

CO-PO AND CO-PSO MAPPING

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

JAD2016	COGNITIVE SCIENCE AND ANALYST	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

CO1 To study cognitive science and cognitive psychology

CO2 To study neuroscience and cognitive neuroscience

CO3 To study cognitive anthropology and linguistics

CO4 To study data analysis and statistical methods

CO5 To study cognitive ergonomics, cognitive science and society

UNIT-I INTRODUCTION TO COGNITIVE SCIENCE**9**

Definition and scope of cognitive science - Historical overview and interdisciplinary nature of cognitive science - Key theories and approaches in cognitive science Cognitive Psychology: Perception and attention - Memory and learning - Language processing and production Problem-solving and decision- making - Cognitive development across the lifespan.

UNIT-II NEUROSCIENCE AND COGNITIVE NEUROSCIENCE**9**

Basic neuroanatomy and brain functions, Neuronal communication and synaptic transmission Methods in cognitive neuroscience research (e.g., fMRI, EEG), Neural correlates of perception, memory, language, and cognition Artificial Intelligence and Cognitive Modeling: Introduction to artificial intelligence (AI) - Cognitive architectures and models (e.g., ACT-R, Soar) - Computational approaches to cognition - Machine learning and neural networks in cognitive modelling.

UNIT-III COGNITIVE ANTHROPOLOGY AND LINGUISTICS**9**

Language and thought, Cultural variations in cognition, Cognitive processes in social and cultural contexts, Philosophy of Mind: Mind-body problem and dualism, Consciousness and self-awareness, Philosophical theories of cognition.

UNIT-IV DATA ANALYSIS AND STATISTICAL METHODS**9**

Descriptive and inferential statistics, Experimental design and hypothesis testing, Statistical software and data visualization techniques.

UNIT-V COGNITIVE ERGONOMICS, COGNITIVE SCIENCE AND SOCIETY**9**

Cognitive Ergonomics and Human-Computer Interaction: User-centered design principles, Human factors in interface design, Cognitive workload and attention in human- computer interaction.

Cognitive Science and Society:

Ethical implications of cognitive science research, Applications of cognitive science in various domains (e.g., healthcare, education, marketing)

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

- Learn the basics of cognitive science.
- Learn the neuroscience and cognitive neuroscience.
- Learn the cognitive anthropology and linguistics.
- Apply statistical methods for various data analysis tasks
- Apply cognitive ergonomics and cognitive science in the society.

TEXT BOOKS

1.Cognitive Neuroscience: A Very Short Introduction, Richard Passingham, Publisher : OUP Oxford, 2016 edition

2. Cognitive Neuroscience 4th Edition, Kindle Edition by Marie T. Banich, Rebecca J. Compton, Kindle Edition, 2018

REFERENCES:

1. Cognitive psychology – A students handbook, by Michale W. Eysenck & Mark T. Keane.

CO-PO AND CO-PSO MAPPING:..

[illegible]

AUTOMATION TOOLS

JAD2001	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts of Agile Software Process.
- To comprehend various Agile Methodologies.
- To develop Agile Software Process.
- To apply principles of Agile Testing.
- To understand metrics used in Agile.

Prerequisite: Software Engineering, Object Oriented Analysis and Design

UNIT-I : INTRODUCTION 9

Software is new product development- Iterative and Evolutionary Methods- Agile Development – Case Study: Perform a comparative Study between Traditional / Heavy weight Methodologies with Agile Methodology.

UNIT-II : AGILE AND ITS SIGNIFICANCE 9

Agile Story: Evolutionary delivery -Scrum Demo- Planning game, -Sprint back log- adaptive planning - Agile Motivation – Problems with The Waterfall - Research Evidence Scrum: Method Overview -Life cycle phases and Work product roles.

UNIT-III : AGILE METHODOLOGY 9

Extreme Programming: Method Overview -Life cycle phases and Work product roles
- Unified process: Method Overview -Life cycle phases and Work product roles- EVO: Method Overview -Life cycle phases and Work product roles -Case Study: Student group must collaborate and report together along with assigned batch members. Collect the requirements from the client and adopt the suitable agile practice method.

UNIT-IV : AGILE PRACTICES 9

Agile Project management - Agile Environment -. Agile Requirements - Case Study
– Practices: At the end of each sprint of automated and acceptance tests

UNIT-V : AGILITY AND QUALITY ASSURANCE 9

Agile product development – Agile Metrics – Feature Driven Development (FDD)- Agile approach to Quality Assurance -Test Driven Development – Agile approach in Global Software Development

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 :** Differentiate agile methodologies and Non –agile methodologies
- CO2 :** Describe the various practices followed in Agile Software Process
- CO3 :** Select suitable agile approach for the projects.
- CO4 :** Understand Agile Environment.
- CO5 :** Apply agile metrics to projects.

TEXT BOOKS:

1. Craig Larman, “Agile and Iterative Development – A Manager’s Guide”, Pearson Education, 2006.
2. Elisabeth Hendrickson Quality Tree Software Inc, “Agile Testing”, 2008.

REFERENCES:

1. Chetankumar Patel, MuthuRamachandran, Story Card Maturity Model (SMM): A Process Improvement Framework for Agile Requirements Engineering Practices, Journal of Software, Academy Publishers, Vol 4, No 5 (2009), 422-435, Jul 2009.E. Capriolo, D Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
2. David J. Anderson; Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
3. Hazza and Dubinsky, “Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.
4. Kevin C. Desouza, “Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

WEBSITE REFERENCES :

1. <https://www.coursera.org/learn/agile-project-management>
2. <https://www.udemy.com/course/introduction-to-agile/>
3. <https://www.infoworld.com/article/3237508/what-is-agile-methodology-modern-software-development-explained.html>
4. <https://www.javatpoint.com/agile>
5. <https://www.nimblework.com/agile/agile-methodology/>

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	3	2	1	2	-	-	-	1	1	3	2
C02	2	3	1	1	1	-	-	-	2	2	1	2
C03	2	2	1	3	1	-	-	-	1	3	1	2
C04	2	1	3	2	1	-	-	-	1	1	1	2
C05	2	2	1	3	1	-	-	-	1	3	2	1
AVG	2.2	2.2	1.6	2	1.2	-	-	-	1.2	2	1.6	1.8

JIT2004	DEVOPS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce DevOps terminology, definition & concepts.
- To understand the different Version control tools.
- To understand the concepts of Continuous Integration and Testing.
- To understand Configuration management using Ansible.
- To illustrate the benefits and drive the adoption of cloud-based Dev ops tools to solve real world problems

Prerequisite: C Programming, Java Programming

UNIT-I : INTRODUCTION TO DEVOPS 9

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

UNIT-II : COMPILE AND BUILD USING MAVEN & GRADLE 9

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases (compile build, test, package) Maven Profiles, Maven repositories (local, central, global), Maven plugins, Maven create and build Artifacts, Dependency management, Installation of Gradle, Understand build using Gradle

UNIT-III : CONTINUOUS INTEGRATION USING JENKINS 9

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNIT-IV : CONFIGURATION MANAGEMENT USING ANSIBLE 9

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

UNIT-V : BUILDING DEVOPS PIPELINES USING AZURE 9

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file

TOTAL: 45 HOURS

COURSE OUTCOMES:**At end of the course students will be able to:**

CO1 : Understand different actions performed through Version control tools like Git.

CO2 : Perform Continuous Integration and Continuous Testing and Continuous

Deployment using Jenkins by building and automating test cases using Maven & Gradle.

CO3 : Ability to Perform Automated Continuous Deployment

CO4 : Ability to do configuration management using Ansible

CO5 : Understand to leverage Cloud-based DevOps tools using Azure DevOps

TEXT BOOKS:

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014

REFERENCES:

1. Hands-On Azure Devops: Cidc Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.
3. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.
4. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.

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1. <https://www.jenkins.io/user-handbook.pdf>
2. <https://maven.apache.org/guides/getting-started/>
3. <https://www.atlassian.com/devops>
4. <https://en.wikipedia.org/wiki/DevOps>
5. <https://www.techtarget.com/searchitoperations/definition/DevOps>

CO-PO MAPPING:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	3	3	-	-	-	-	-	-	3	-	2	3
CO2	3	3	2	3	-	-	-	-	3	-	2	3
CO3	3	-	3	3	-	-	-	-	-	-	-	3
CO4	3	3	-	3	-	-	-	-	3	-	2	-
CO5	3	2	-	-	2	-	-	-	3	-	3	-
AVG	3	2.7	2.5	3	2	-	-	--	3	-	2.2	3

JAD2003	SOFTWARE TESTING USING SELENIUM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the basics of software testing.
- To study selenium web driver.
- To study the test frameworks and test design.
- To study test reporting and logging.
- To study dynamic web elements and automation for web services.

Prerequisite: Software Engineering, Software Testing.

UNIT-I : INTRODUCTION TO SOFTWARE TESTING & SELENIUM 9

Fundamentals of software testing - Testing lifecycle and methodologies - Role of automation in software testing Introduction to Selenium: Overview of Selenium and its features - Selenium WebDriver architecture - Setting up the Selenium environment

UNIT-II : SELENIUM WEBDRIVER 9

Selenium WebDriver Basics: Locating web elements using different techniques (e.g., ID, XPath, CSS selectors) - Interacting with web elements (e.g., clicking, typing, selecting) - Handling different types of web elements (e.g., text fields, checkboxes, dropdowns)

UNIT-III : TEST FRAMEWORKS AND TEST DESIGN 9

Introduction to test frameworks (e.g., TestNG, JUnit) - Creating test cases and test suites - Organizing tests and test data - Test design techniques (e.g., boundary value analysis, equivalence partitioning) Test Automation

UNIT-IV : TEST REPORTING AND LOGGING 9

Generating test reports and logs - Analyzing test results and debugging failures - Integration with Continuous Integration (CI) tools (e.g., Jenkins) Selenium Grid and Cross-Browser Testing: Introduction to Selenium Grid - Parallel test execution for improved efficiency

UNIT-V : ADVANCED TOPICS IN SELENIUM 9

Introduction to Test Automation for Web Services: Overview of testing web services - Introduction to tools/frameworks for web service testing (e.g., REST Assured) - Testing API endpoints and response validation.

TOTAL: 45 HOURS

At end of the course students will be able to:

CO2 : Learn the selenium web driver

CO4 : Learn test reporting and logging techniques.

CO5 : Learn dynamic web elements and automation for web services.

1. Paul C , “Software. Testing. A Craftsman's Approach”, CRC press, Fourth Edition, 2013.
2. Satya Avasarala, ‘Selenium WebDriver Practical Guide’, 2014.

1. Unmesh Gundecha, “Selenium Testing Tools Cookbook”, 2nd Edition, 2015.
2. Zhimin Zhan, “Selenium WebDriver Recipes in C#”, Apress publisher, 2015.
3. Dima Kovalenko, “Selenium Design Patterns and Best Practices”, Packt Publishing, 2018.
4. S BASU, “Selenium with Python Simplified For Beginners”, Independently published 2020.

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2. <https://www.javatpoint.com/software-testing-tutorial>
3. <https://www.javatpoint.com/selenium-webdriver>
4. https://www.tutorialspoint.com/selenium/selenium_webdriver.htm
5. <https://support.smartbear.com/testcomplete/videos/testcomplete-basics-logging-and-reporting/>

[illegible]

JAD2004	PANDAS FOR DATA ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of data analysis and its importance in various fields
- To utilize the pandas plotting subpackage for data visualization.
- To understand the process of building a Python package for data analysis.
- To learn techniques for preprocessing data before applying machine learning algorithms.
- To understand the process of hyperparameter tuning using grid search.

Prerequisite: Statistics and Probability, Database management systems.

UNIT-I : FUNDAMENTALS OF DATA ANALYSIS

9

Fundamentals of data analysis-Statistical foundations-Setting up a virtual environment-Pandas data structures-Bringing data into a Pandas DataFrames-Inspecting a DataFrame object-Grabbing subsets of the data-Adding and removing data

UNIT-II :USING PANDAS FOR DATA ANALYSIS

9

Data Wrangling with Pandas:Data Wrangling-Collecting temperature data-Cleaning up the data-Restructuring the data-Handling duplicate, missing,or invalid data-Database-style operations on DataFrames- DataFrame operations-Aggregations with pandas and numpy-Time Series-plottingwith pandas-the pandas.plotting subpackage

UNIT-III: APPLICATIONS AND PLOTTING

9

Seaborn utility-Formatting-Customizing Visualizations-Building a python package-Data extraction with pandas-Exploratory data analysis-Modeling performance-Simulating login attempts-Rule based anomaly detection.

UNIT-IV: MACHINE LEARNING WITH SCIKIT

9

Exploratory data analysis-preprocessing data-clustering –Regression-Classification

UNIT-V :METHODS TO OPTIMIZE DATA

9

Hyperparameter tuning with grid search-Ensemble methods-Inspecting classification prediction confidence-Addressing class imbalance-Regularization-Unsupervised methods-Supervisedmethods-Online Learning

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 :**Understand the fundamentals of data analysis.
- CO2 :** Able to perform various operations and aggregations using Pandas and NumPy.
- CO3 :** Able to perform exploratory data analysis on different datasets.
- CO4 :** Have a good understanding of classification techniques and algorithms.
- CO5 :** Have a good understanding of ensemble methods and their application.

TEXT BOOKS:

1. Stefanie Molin, “Hands-On Data Analysis with Pandas”, Packt Publishing Ltd, 2019.
2. Ashish Kumar, “A Complete Guide to Pandas, from Installation to Advanced Data Analysis Techniques”, 2nd Edition, 2019.

REFERENCES:

1. Alvaro Fuentes, “Become a Python Data Analyst”, Packt Publishing, 2018
2. Jacqueline Kazil, Katharine Jarmul, “Data Wrangling with Python”, O'Reilly Media, 2016.
3. Hannah Stepanek, “Thinking in Pandas”, Apress, 2020.

WEBSITE REFERENCES :

1. https://www.google.co.in/books/edition/Thinking_in_Pandas/pZnpDwAAQBAJ?hl=en&gbpv=0
2. https://www.google.co.in/books/edition/Hands_On_Data_Analysis_with_Pandas/buGIDwAAQBAJ?hl=en&gbpv=1&printsec=frontcover
3. <https://www.packtpub.com/product/hands-on-data-analysis-with-pandas-second-edition/9781800563452>
4. <https://www.goodreads.com/book/show/45861407-hands-on-data-analysis-with-pandas>
5. <https://searchworks.stanford.edu/view/13489419>

CO-PO AND CO-PSO MAPPING:

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

JAD2005	DATA VISUALIZATION USING TABLEAU	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To perceive in-depth knowledge on how to represent data with visual analytics as suits the target audience, task and data.
- To equip the students with knowledge of visual encoding design choices for arranging and representing data in an interactive and spatial form.
- To gain an insight into Data Visualization techniques and tools.
- To explore business insights and achieve business goals in the right direction
- To provide insight and training on designing visualization dashboard that would support decision making on large scale data

Prerequisite: Database Management Systems, Data Mining and Warehousing.

UNIT-I :INTRODUCTION

9

Purpose of visualization, Data Abstraction: Data Types, Dataset types, Attribute types, Semantics, Preparing your Data, Survey Data, Compute descriptive Statistics, Explore the data visually, Design Standards: Chart Format, Color, Text and Labels Readability, Scales, data Integrity, chart Junk, data density, data richness, Attribution and Design Standard Checklist. Task Abstraction: Actions, Targets, Analyzing & Deriving – Example, Four levels for Validation, Marks and Channels, Analysis – Four levels of Validation.

UNIT-II :Data Manipulation with Pandas

9

Introduction, Data Indexing and selection, operating on data, handling missing data, Hierarchical Indexing, combining dataset, Aggregation and Grouping, Pivot tables, String operation Visualization with Matplotlib: Line plots, Scatter Plots, Visualizing Errors, Density and Contour plots, Histogram, Customizing Plot legends, Color bars, Text and Annotation, Three dimensional Plotting, Geographic data with base map, visualization with sea born

UNIT-III : VISUALIZATION TECHNIQUES

9

Arrange tables, Arrange Network and Trees, Map Color and other Channels, Manipulate Views, Facet, Reduce Items and Attributes: Filter, Aggregate, Time-Series Data visualization, Text data Visualization, Multivariate data visualization.

UNIT-IV :DATA VISUALIZATION USING TABLEAU

9

Exploratory Data Analysis using Tableau Visualizations, Creating basic visualizations- Bar Chart, Geographic map, Crosstab Report, Scatter plot, Line Chart, Connecting to Data, Live Connection, Extract Data, Combine data sources, Join tables, Blend data sources, cross- database join, filtering and sorting data, creating groups and hierarchies - Publishing to Tableau Server - Mapping

Geographic Maps, Filled Maps, Mapping options Heat Map, Choropleth map and highlight table, Histograms, Dashboard Development -design Principles and Interactivity

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand the need for data abstraction and task abstraction and would be able to relate with the various data, datasets associated with different applications.

CO2 : Apply the various visual analytics techniques available for arranging the different types of data.

CO3 : Identify and apply appropriate data visualization techniques, given particular requirements imposed by the data.

CO4 : Employ best practices in data visualization to develop charts, maps, tables and other visual representations of data and would be able to identify the need for reducing and aggregating item-sets.

CO5 : Apply the different exploratory data analysis techniques on the datasets using Tableau.

TEXT BOOKS:

1. Sosulski K (2018), "Data Visualization made simple: Insights into Becoming Visual, New York: Routledge.
2. Jake VanderPlas "Python Data Science Handbook", November 2017.

REFERENCES:

1. TamaraMunzner, "Visualization Analysis and Design", December 2014.
2. Few, Stephen, "Show me the numbers: Designing Tables and Graphs to Enlighten" 2nd Edition. Analytics Press Publishers June 2012.
3. Mathew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
4. Stephen Few, "Information Dashboard Design: Displaying Data for At-a-glance Monitoring", Analytics Press, 2nd Edition, 2013.

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1. <https://datavizproject.com/>
2. <https://app.rawgraphs.io/>
3. <https://www.datawrapper.de/>
4. <https://www.tableau.com/>
5. <https://www.tableau.com/learn/articles/data-visualization>

CO-PO AND CO-PSO MAPPING:

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

JAD2006	JENKINS AUTOMATION FOR SERVER	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Understand the automation tools and their application
- To Learn about Jenkins interface and its role in
- To Understand Version Control Integration for Jenkins
- To Learn about Continuous Delivery and Deployment with Jenkins
- To Learn about advanced server automation concepts.

Prerequisite: Operating Systems, Computer Network

UNIT-I : INTRODUCTION TO SERVER AUTOMATION TOOLS 9

Introduction-Overview of server automation- benefits-Introduction to popular server automation tools-Understanding infrastructure as code (IaC) principles,Ansible Automation-Introduction-architecture- components and terminology-Chef Automation-Introduction to Chef: architecture, components, and terminology- Puppet Automation-Introduction to Puppet: architecture, components, and terminology-SaltStack Automation-Introduction to SaltStack: architecture, components, and terminology- Comparison and Selection of Automation Tools

UNIT-II : INTRODUCTION 9

Introduction to Jenkins-Overview of Jenkins and its role in software development and automation-Installation and setup of Jenkins on a local machine or server-Familiarization with the Jenkins user interface and basic configuration options-Introduction to Jenkins jobs and their types (e.g., Freestyle, Pipeline)-Creating and configuring jobs using the Jenkins web interface -Parameterized builds and job triggering options

UNIT-III : VERSION CONTROL INTEGRATION 9

Version Control Integration- Integrating Jenkins with popular version control systems-Setting up build triggers on version control events-Configuring webhooks for automatic job triggering-Continuous Integration with Jenkins- principles of continuous integration (CI)-Configuring Jenkins for automated build and unit testing-Running tests and generating test reports with Jenkins

UNIT-IV : CONTINUOUS DELIVERY AND DEPLOYMENT WITH JENKINS 9

Introduction to continuous delivery and deployment -Creating deployment pipelines in Jenkins-Integrating Jenkins with deployment tools -Jenkins Pipeline Fundamentals-Understanding Jenkins pipelines and their advantages -Implementing Jenkins pipelines using the declarative syntax- Writing Jenkins files for defining and managing pipelines

UNIT-V : ADVANCED TOPICS IN SERVER AUTOMATION

9

Configuration management with multiple environments -Integration of server automation tools with version control systems- Implementing advanced features like idempotence, conditional execution, and error handling-Advanced Jenkins Pipeline Concepts -Using Jenkins pipeline stages and steps- Scripted pipeline syntax and advanced scripting techniques -Error handling, parallel execution, and agent configuration in Jenkins pipelines- Jenkins Plugin Ecosystem.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1:Apply the automation techniques
- CO2:Apply server automation tools for server validation
- CO3:Apply version control integration of various projects
- CO4:Learn about Continuous delivery
- CO5:Learn about advanced server automation tools

TEXT BOOKS:

1. “Intelligent Automation: Welcome to the world of Hyper automation”, Pascal Bornet , World Scientific Publishing Co Pvt Ltd.,2020.
2. Arnon Axelrod,” Complete Guide to Test Automation”,Apress publications,2020

REFERENCES:

1. Walter de Gruyter ,“Robotic Process Automation Management, Technology, Applications”, de Gruyter Publication,2021.
2. Bernd Ruecker ,”Practical Process Automation”,OReilly media Publication,2021.
3. Mitesh Soni, “Hands-on Pipeline as YAML with Jenkins”, BPB Publications, 2021.
4. Brent Laster, “Jenkins 2: Up and Running”, O'Reilly Media, 2018.

WEBSITE REFERENCES :

1. <https://www.jenkins.io/>
2. https://www.tutorialspoint.com/jenkins/jenkins_automated_testing.htm
3. <https://www.testim.io/blog/jenkins-test-automation/>
4. <https://www.youtube.com/watch?v=PAKWqRE0aTk>
5. <https://www.youtube.com/watch?v=f4idgaq2VqA>

CO-PO MAPPING:

[illegible]

JAD2007	CLOUD COMPUTING TOOLS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the principles of cloud architecture, models and infrastructure.
- To understand the concepts of virtualization and virtual machines.
- To gain knowledge about virtualization Infrastructure.
- To explore and experiment with various Cloud deployment environments.
- To learn about the security issues in the cloud environment

Prerequisite: Computer Networks, Cloud computing

UNIT-I : Cloud Computing Overview 9

Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT-II : Cloud Insights 9

Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability, simplicity, vendors, security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT-III : Cloud Architecture- Layers and Models 9

Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT-IV : Cloud Simulators- CloudSim and GreenCloud 9

Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud

UNIT-V : Introduction to VMWare Simulator 9

Basics of VMWare, advantages of VMware virtualization, using VMware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host,cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 : Understand the design challenges in the cloud.
- CO2 : Apply the concept of virtualization and its types.
- CO3 : Experiment with virtualization of hardware resources and Docker.
- CO4 : Develop and deploy services on the cloud and set up a cloud environment.
- CO5 : Explain security challenges in the cloud environment.

TEXT BOOKS:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008
3. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
4. James Turnbull, “The Docker Book”, O’Reilly Publishers, 2014

REFERENCES

- 1 Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,FernHalper, Wiley Publishing, Inc, 2010
- 2 Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
- 3 James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
- 4 Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy: an enterprise perspective on risks and compliance”, O’Reilly Media, Inc., 2009.

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- a. <https://www.cloudzero.com/blog/cloud-computing-tools>
- b. https://www.ibm.com/cloud/free?utm_content=SRCWW&p1=Search&p4=43700075080984306&p5=p&gclid=Cj0KCQjw7aqkBhDPAIsAKGa0oJ5hTJCgy9JVMAbDqxKyh0KbBCmHrqfm80UeIe4YAojIAJiw2ifDKEaAvkZEALw_wcB&gclsrc=aw.ds
- c. <https://www.knowledgehut.com/blog/cloud-computing/cloud-computing-tools>
- d. <https://mindmajix.com/cloud-computing-tools>
- e. <https://www.analyticssteps.com/blogs/top-cloud-computing-tools-market>

CO-PO MAPPING:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	PO10	PO11	PO12
CO1	3	1	3	3	-	-	-	-	2	3	3	3
CO2	2	2	2	1	1	-	-	-	3	2	3	1
CO3	2	1	2	1	1	-	-	-	-	1	2	1
CO4	2	2	2	1	-	-	-	-	1	2	1	3
CO5	3	1	1	2	1	-	-	-	3	2	1	2
AVG	3	2	2	2	1				3	2	2	2

JAD2008	INFRASTRUCTURE BUILD TOOL USING TERRAFORM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the principles and benefits of Infrastructure as Code.
- To gain proficiency in using Terraform as an infrastructure build tool.
- To learn to install and configure Terraform for various cloud providers.
- To develop the skills to write Terraform configurations to provision infrastructure resources.
- To acquire knowledge of advanced Terraform concepts like managing multiple environments and using plugins.

Prerequisite: Computer Networks, Cloud Computing

UNIT-I : INTRODUCTION TO INFRASTRUCTURE AS CODE AND TERRAFORM 9

Overview of Infrastructure as Code concepts - Introduction to Terraform and its benefits - Terraform ecosystem and components.

UNIT-II : TERRAFORM INSTALLATION AND CONFIGURATION 9

Installing Terraform on different platforms - Setting up the development environment - Configuring Terraform for various cloud providers.

UNIT-III : TERRAFORM BASICS 9

Understanding Terraform configuration files - Declaring and managing infrastructure resources - Working with variables and data types - Resource dependencies and ordering.

UNIT-IV : PROVISIONING INFRASTRUCTURE WITH TERRAFORM 9

Creating and managing AWS infrastructure with Terraform - Provisioning virtual machines, storage, and networking components - Leveraging Terraform modules for reusable infrastructure code - Handling Terraform state and remote backends.

UNIT-V : TERRAFORM ADVANCED CONCEPTS 9

Managing infrastructure across multiple environments: dev, staging, production - Using conditionals and loops in Terraform configurations - Terraform workspace and environment management - Terraform providers and plugins.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 :** Explain the concept of Infrastructure as Code and its significance.
- CO2 :** Install and configure Terraform for infrastructure provisioning.
- CO3 :** Write Terraform configurations to define and manage infrastructure resources.
- CO4 :** Provision and manage infrastructure using Terraform across different cloud providers.
- CO5 :** Apply advanced Terraform techniques such as managing multiple environments and utilizing plugins.

TEXT BOOKS:

1. Yevgeniy Brikman, "Terraform: Up & Running", O'Reilly Media, 2017.
2. Kief Morris, "Infrastructure as Code: Managing Servers in the Cloud", O'Reilly Media, 2016.

REFERENCES:

1. Stephane Jourdan, Thomas Peham, Eberhard Wolff, and Sergey Prysmak, "Infrastructure as Code Cookbook ", Packt Publishing, 2020.
2. Scott Winkler and Martin Atkins "Terraform in Action", Manning publications.
3. Mikael Krief , "Terraform Cookbook: Efficiently define, launch, and manage Infrastructure as Code across various cloud platforms", Packt Publishing, 2020.
4. vgeniy Brikman , "Terraform: Up & Running: Writing Infrastructure as Code", O'Reilly Media, 2nd Edition, 2019.

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1. <https://k21academy.com/terraform-iac/terraform-beginners-guide/>
2. <https://developer.hashicorp.com/terraform/tutorials/aws-get-started/infrastructure-as-code>
3. <https://developer.hashicorp.com/terraform/intro>
4. <https://www.youtube.com/watch?v=3J3wSzKVJ2A>
5. <https://www.azuredevopslabs.com/labs/vstsextend/terraform/>

CO-PO MAPPING:

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	PO10	PO11	PO12
CO1	3	2	1	3	2	2	1				2	3
CO2	3	2	2	2	2	1	1				1	2
CO3	2	2	2	3	3	1					2	2
CO4	2	2	3	3	2	2	1				2	2
CO5	2	2	3	3	2	2					2	2
AVG	2.4	2	2.2	2.8	2.2	1.6	0.6	0	0	0	1.8	2.2

IoT:Internet Of Things

PREREQUISTE: Python Programming, Computer Networks,Mobile Computing,Internet Of Things

JIT2009	INTERNET OF THINGS: ARCHITECTURE PROTOCOLS AND APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Understand the Architectural Overview of IoT
- To Understand the IoT Reference Architecture and Real World Design Constraints
- To Understand the various IoT Protocols.
- To Understand various IoT transport & session layer protocols.
- To Understand various IoT service layer protocols and security

UNIT-I OVERVIEW 9

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT-II REFERENCE ARCHITECTURE 9

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT-III IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS 9

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN,6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

UNIT-IV TRANSPORT & SESSION LAYER PROTOCOLS 9

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer HTTP,CoAP, XMPP, AMQP, MQTT

UNIT-V SERVICE LAYER PROTOCOLS & SECURITY 9

Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL, Application Layer

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1** : Describe the basic concept and architecture of IOT systems
- CO2** : Understand key skills employed in the IIoT & IoRT space building applications.
- CO3** : Analyze various IoT Comprehend IOT protocols
- CO4** : Analyze various IoT Comprehend IOT protocols
- CO5** : Analyze various IoT service layer protocols and security

TEXT BOOKS:

1. JanHoller, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

REFERENCES:

1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on Approach)”, 1st Edition, VPT, 2014

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1. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html
2. <https://www.hindawi.com/journals/jece/2017/9324035>
3. <https://www.sciencedirect.com/science/article/pii/B9780128205815000134>

CO-PO AND CO-PSO MAPPING:

CO/ PO, PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		1	1							
CO2	3	2	3	3		1	1							
CO3	3	3	2	3		2	2							
CO4	3	3	3	2		2	2							
CO5	3	2	2	2		2	2							
AVG	3	3	3	3		2	2							

JIT2010	PROGRAMMING FOR IOT BOARDS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce Internet of Things (IoT) environment and its technologies for designing smart systems
- To explore open-source computer hardware/software platform, development and debugging environment, programming constructs and necessary libraries
- To learn embedded programming constructs and real time systems
- To understand various options in programming languages
- To test, debug, and deploy and to solve real world problems.

UNIT-I : INTRODUCTION TO IOT BOARDS 9

IoT- Introduction and Characteristics, Things, Architecture, Enabling Technologies, Challenges, Levels - Environment -board, IDE, shields; Programming - syntax, variables, types, operators, constructs and functions; sketch - skeleton, compile and upload, accessing pins; debugging - UART communication protocol and serial library

UNIT-II : INTERFACING WITH IOT BOARDS 9

Circuits - design, wiring, passive components; sensors and actuators, interfacing, read and write; software libraries to handle complicated hardware; shields, interfacing and libraries

UNIT-III : Single Board Computers and Python Interfacing 9

Board schematic, setup, configure and use, OS implications; linux - basics, file system and processes, shell CLI, GUI; python - basics, API's RPi.GPIO, PWM library to access pins, Tkinter Networking - Internet Connectivity, Standard Internet Protocols, MQTT, CoAP, Networking Socket Interface; Cloud - Public APIs and SDK's for accessing cloud services, Twitter API using Twython package; Interfacing - sensors and actuators, Pi Camera, Servo, A/D, D/A

UNIT-IV : Embedded Programming and RTOS 9

MCU - GPIO, WDT, timers/counters, IO, A/D, D/A, PWM, Interrupts, Memory, serial communication UART, I2C, SPI, Peripheral Interfacing OS - basics, types, tasks, process, threads

(POSIX Threads), thread preemption, Preemptive Task Scheduling Policies, Priority Inversion, Task communication, Task Synchronization issues - racing and deadlock, binary and counting semaphores (Mutex example), choosing RTOS

UNIT-V :Real World Projects

9

IoT Integrated Primary Health Care, Large Scale Face Detection by AI Powered Street Lights, Cloud IoT Systems for Smart Agriculture, Smart Home Gadgets, Autonomous Car Features – speed and horn intensity control.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand basic circuits, sensors and interfacing, data conversion process and shield libraries to interface with the real world

CO2 : Program SBC for practical IoT devices using Python

CO3 : Explore protocols, data conversion process, Api and expansion boards for real world interaction

CO4 : Learn embedded programming constructs and constraints real time systems

CO5 : Illustrate IoT prototyping for real world socio-economic problems

TEXT BOOKS:

1. Yamanoor, Sai, and Srihari Yamanoor. Python Programming with Raspberry Pi, 1st edition, Packt Publishing Ltd, 2017.
2. Donald Norris, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, 1st edition, McGraw Hill Education, 2015

REFERENCES:

1. Marco Schwartz, Home Automation with Arduino, 3rd edition, Open Home Automation 2014.
2. Schwartz, Marco. Internet of things with arduino cookbook, 1st edition, Packt Publishing Ltd, 2016.
3. Kooijman, Matthijs. Building Wireless Sensor Networks Using Arduino, 1st edition, Packt Publishing Ltd, 2015.

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1. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/lab-workshop-on-internet-of-things-iot/>
2. <https://ict.iitk.ac.in/courses/learn-iot-through-arduino-and-raspberry-pi/>
3. https://onlinecourses.swayam2.ac.in/arp20_ap03/preview

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				3									
CO2	3													
CO3	3		3	3										
CO4	3													
CO5		3												
AVG	3	3	3	3	3									

JIT2011	INDUSTRIAL IoT 4.0	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To develop knowledge in Industrial Internet of Things (IIoT) fundamentals.
- To understand the architecture, IOT and its protocols
- To Understand the various data analytics techniques
- To Understand the CPS for Industry 4.0
- To provide students with a good depth of knowledge of Designing Industrial IOT Systems for various applications

UNIT-I : Industrial IOT Introduction

9

Introduction to IOT, IOT Vs. IIOT, History of IIOT, Components of IIOT - Sensors and Actuators for Industrial Processes, Role of IIOT in Manufacturing Processes. Challenges & Benefits in implementing IIOT.

UNIT-II: IIoT Architecture

9

Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models, Industrial IoT-Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking

UNIT-III : IIOT ANALYTICS

9

Big Data Analytics and Software Defined Networks, Machine Learning and Data Science, Julia Programming, Data Management with Hadoop.

UNIT-IV : Industrial IoT: CYBER PHYSICAL SYSTEM

9

Introduction to Cyber Physical Systems (CPS), Architecture of CPS- Components, Data science and technology for CPS, Emerging applications in CPS in different fields. Case study: Application of CPS in health care domain.

UNIT-V : Industrial IoT- Application Domains

9

Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 :**To understand the basics of industrial IoT (IIoT).
- CO2 :**To develop various applications using IIOT architectures
- CO3 :** Recognize the uses of cloud computing and data analytics
- CO4 :**Analyze privacy and security measures for industry standard solutions
- CO5 :**Design and implement IOT applications that manage various technology

TEXT BOOKS:

1. Veneri, Giacomo, and Antonio Capasso- Hands-on Industrial Internet of Things: Create a Powerful Industrial IoT Infrastructure Using Industry 4.0, 1stEd., Packt Publishing Ltd,2018
2. Alasdair Gilchrist- Industry 4.0: The Industrial Internet of Things, 1st Ed., Apress, 2017

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1. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, 1st Edition, Apress, 2017
2. Aboul Ella Hassanien, Nilanjan Dey and Sureaka Boara, Medical Big Data and Internet of Medical Things: Advances, Challenges and Applications, 1st edition, CRC Press, 2019.

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2. <https://www.coursera.org/specializations/developing-industrial-iiot/courses>
3. <https://www.coursera.org/learn/industrial-internet-of-things>.
4. <https://www.coursera.org/learn/internet-of-things-sensing-actuation>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2	3													
CO3	3		3											
CO4	3													
CO5		3												
AVG	3	3	3											

JIT2012	IoT in HealthCare	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To design products related to IoT based Health care applications
- To Understand and design multidisciplinary approach for design, development,
- To simulate, and implement IoT health care systems.
- To Apply the monitored health parameter sensor output data for further computing, analyzation and visualization.
- To Identify and summarize remote health monitoring and Tele-health.

UNIT-I : INTRODUCTION TO IOT BASED HEALTH CARE

9

Introduction to IoT applications in smart healthcare& their distinctive advantages - Patient Health Monitoring System (PHMS), Tele-Health, TeleMedicine, Tele-Monitoring, Mobile Health Things (m-health).

UNIT-II: IOT SMART SENSING HEATH CARE AND POWER CHALLENGE

9

Concept of Generic Biomedical sensors, Smart Sensors: Monitor health parameters, Wearable ECG sensors, IoT Data Acquisition System, Energy harvesting, Battery based systems, Power management.

UNIT-III : INTERNET OF MEDICAL THINGS

9

Data Confidentially, Data Integrity, Data Protection, Security awareness, Emergent threats: Autonomous, IoT heterogeneity and ubiquity, Physical environment.

UNIT-IV SECURITY AND PRIVACY

9

Security, Privacy and Ethical Issues Smart Health and well-being Applications Risk Analysis Cyber-Physical-Social Systems, Machine Ethics, Physical Safety Software Quality, IT Security, Privacy, Risk of Technology Misuse

UNIT-V : WEARABLE TECHNOLOGIES – CASE STUDIES

9

Soft Skin simulation for Wearable Haptic Rendering, Design Challenges for real wearable computers, Collaboration with wearable computers. IoT Based Contactless Body Temperature Monitor.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand and design multidisciplinary approach for design, development, simulation, and implementation of IoT health care systems.

CO2 : Apply the monitored health parameter sensor output data for further computing,analyzation and visualization.

CO3 : Identify and summarize remote health monitoring and Tele-health

CO4 : Elaborate security, privacy and ethical issues in smart sensor health and well-being application

CO5 : Learn about the requirement's to design Frameworks for Wearable Computing

TEXT BOOKS:

1. Dac-Nhuong Le,” Emerging Technologies for Health and Medicine: Virtual Reality, Augmented Reality, Artificial Intelligence, Internet of Things,Robotics, Industry 4.0,” Wiley, 2019
2. S. Misra, A. Mukherjee, and A. Roy “Introduction to IoT”. CambridgeUniversity Press, 2017

REFERENCES:

1. Qusay F. Hassan “ Internet of Things A to Z Technologies and Applications,
2. Intelligent Data Sensing and Processing for Health and Well-being Applications, Miguel Antonio Wister Ovando, Pablo Pancardo Garcia,Francisco Diego Acosta Escalante, Jose Adan Hernandez Nolasco
3. Vankamamidi S. Naresh1,Suryateja S. Pericherla,Pilla Sita Rama Murty,SivaranjaniReddi, “Internet of Things in Healthcare: Architecture, Applications, Challenges, and Solutions”,International Journal of Computer Systems Science &Engineering,vol 35 no 6 November 2020

WEBSITE REFERENCES :

1. <https://www.udemy.com/course/iot-based-emergency-health-care-system>
2. <https://skill-lync.com/medical-technology-courses/iot-healthcare>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2	3													
CO3	3		3											
CO4	3													
CO5		3												
AVG	3	3	3											

JIT2013	Robotics in IOT				L	T	P	C
					3	0	0	3

COURSE OBJECTIVES:

- To learn basics of Internet of Things (IoT), and its execution using multiple robotic sensors
- To understand Internet of Robotic Things (IoRT) and its various implementations in industry and automation
- To implement IoT and Robotics application in autonomous driving and health care
- To Learn the design and analysis of Industry 4.0 systems for Energy and smart vehicular applications.
- To understand the Cloud Robotics and Industrial Automation

UNIT-I : Introduction to IoT and Vision systems

9

History and evolution of IoT, AI, ML, Machine Vision, optoelectronic sensors, 3D & 2D machine vision technologies, robot navigation, control schemes, motion controllers, intelligent algorithms and vision systems.

UNIT-II: Robotic Sensors

9

Optical sensors and actuators; Mechanical sensors and actuators; Acoustic sensors and actuators; Performance characteristics of sensors and actuators.

UNIT-III : Internet of Robotic Things

9

Communication architecture for IoRT; Decentralized and automated IoT infrastructure using Blockchain; IoRT Platforms Architecture, IoRT applications

UNIT-IV :Autonomous Vehicle Systems 9

Introduction to Autonomous Driving; Perception in Autonomous Driving; Robot Operating System (ROS) Overview - Client Systems for Autonomous Driving - Decision planning and control in autonomous vehicle systems - Cloud Platform for Autonomous Driving.

UNIT-V : Cloud Robotics and Industrial Automation 9

IoMT and Robotics in Healthcare IoMT Driven connected healthcare, Efficient design for IoMT based healthcare design, Robotics in healthcare, Components of Cloud Robotics; Limitations and challenges of Cloud Robotics; Applications:Autonomous mobile robots, Cloud medical robots, Industrial robots.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 :** Understand IoT ecosystem in robotic paradigm
- CO2 :** Analyze IoT infrastructure and develop IoRT applications
- CO3 :** Apply IoT in robotics over different platforms
- CO4 :** Implement Cloud robotics in automations
- CO5 :** Implement automated applications using multiple robotic sensors

TEXT BOOKS:

1. Vermesan, Ovidiu, and Joël Bacquet, eds., Cognitive Hyperconnected Digital Transformation: Internet of Things Intelligence Evolution, 1st edition, River Publishers, 2017.
2. A.K.Gupta, S.K.Arora, and J.Riescher, Industrial Automation and Robotics, 1st edition , Mercury Learning and Information LLC,2017

REFERENCES:

1. A.K Dubey, A.Kumar, and S.R Kumar., AI and IoT-based Intelligent Automation in Robotics, 1st edition. Wiley, 2020
2. . A.E.Hassanien, N.Dey, and S.Borra, Medical Big Data and Internet of Medical Things: Advances, Challenges and Applications, 1st edition ,Taylor & Francis Group,2019
3. S.Liu, L.Li and J.Tang, Creating Autonomous Vehicle Systems, Synthesis Lectures on Computer Science, 1st edition ,Morgan & Claypool,2018
4. Nathan Ida, Sensors, Actuators, and Their Interfaces: A multidisciplinary introduction, 2nd

edition The Institution of Engineering and Technology, 2017

WEBSITE REFERENCES :

1. <https://www.udemy.com/course/iot-robotics-hacking-nodemcu/>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		2	2	2						
CO2	3	3	3	3										
CO3	3	3	3	3		1	1	1						
CO4	3	3	3	3		1	1	1						
CO5	3	3	3	3										
AVG	3	3	3	3		2	2	2						

JIT2014	MOBILE APPLICATION DEVELOPMENT FOR IOT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the mobile application development for Internet of Things (IoT) devices
- To deploy various components of mobile devices and essential sensors for various application
- To understand architectures and models used in Mobile
- To understand analytics and security aspects of mobile applications in IoT platforms
- To apply the technologies for low power wireless devices.

UNIT-I : INTRODUCTION TO IOT ECOSYSTEM

9

IoT ecosystem; Industry 4.0; Application development platforms for IoT; IoT Data sources

UNIT-II: SENSOR FOR MOBILE AND HANDHELD DEVICES

9

Temperature sensors, Proximity sensor, IR sensors, Image sensors, Motion detection sensors, Accelerometer sensors, Gyroscope sensors, Optical sensors

UNIT-III: SENSOR DATA PROCESSING

9

Sensor Data-Gathering and Data-Dissemination Mechanisms; Sensor Database system architecture; Sensor data-fusion mechanisms; Data-fusion Architectures and models

UNIT-IV: PROGRAMMING FRAMEWORKS FOR INTERNET OF THINGS

9

IoT Programming Approaches: Node-Centric Programming - Database approach - ModelDriven Development - IoT Programming Frameworks: Android Things - ThingSpeak - IoTivity - Node-RED - DeviceHive - Contiki and Cooja – Zetta

UNIT-V: COMMUNICATION TECHNOLOGIES FOR LOW POWER WIRELESS INTERACTIONS

9

Wireless communications in product development – Bluetooth LE - Near Field Communications (NFC) – WiFi; Prototyping Bluetooth LE with Arduino Nano; Power management strategies and practices Case Study

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 :** Outlines a fundamental full stack architecture for IoT
- CO2 :** Describes various development technologies in each IoT layer
- CO3 :** Develops IoT applications using standardized hardware and software platforms.
- CO4 :** Creates prototype using low power communication technologies.
- CO5 :** Explains IoT solution development from Product management perspective

TEXT BOOKS:

1. Kale, Vivek. Parallel Computing Architectures and APIs: IoT Big Data Stream Processing 1st edition, CRC Press, 2019.
2. Lea, Perry. Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, 1st edition, Packt Publishing Ltd, 2018.

REFERENCES:

1. Fadi Al-Turjman, Intelligence in IoT-enabled Smart Cities, 1st edition, CRC Press, 2019
2. Giacomo Veneri, and Antonio Capasso, Hands-on Industrial Internet of Things: Create a powerful industrial IoT infrastructure using Industry 4.0, 1st edition, Packt Publishing, 2018

WEBSITE REFERENCES :

1. <https://www.silabs.com/support/training/app-103-mobile-app-development-for-iot>
2. <https://www.classcentral.com/course/mobile-development-in-iot-73972>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3		2	2	2	3	3	3	3
CO2	3	3	3	3					3	3	3	3
CO3	3	3	3	3		1	1	1	3	3	3	3
CO4	3	3	3	3		1	1	1	3	3	3	3
CO5	3	3	3	3					3	3	3	3
AVG	3	3	3	3		2	2	2	3	3	3	3

JIT2015	COGNITIVE IOT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Introduce cloud computing and enabling technologies
- To Explore the need for fog and edge computation
- To Impart the knowledge to log the sensor data and to perform further data analytics
- Impart the knowledge to log the sensor data and to perform further data analytics
- Make the students to apply Internet of Things (IoT) data for business solution in various domain in secured manner

UNIT-I : Cognitive IoT – Introduction

9

Cognitive IoT, Need for Cognitive IoT, Current and Future trends of IoT, Cognitive computing and applications. Data Analytics for IoT Regression, Data Analytics for IoT ANN Classification, Data Analytics for IoT Modern DNN's

UNIT-II: Secure Fog-Cloud of Things

9

Secure Fog-Cloud of Things: Architectures, Opportunities & Challenges IoT Architecture and Core IoT, Collaborative and Integrated Edge Security Architecture, A connected ecosystem, Threat and security in IoT.

UNIT-III : GPU Architecture

9

Introduction to GPU's Parallel programming for GPU, Parallel programming in CUDA, CNN

Inference in GPU, CNN Training in GPU. FPGA for Internet of Things Benefits of FPGA, Interfacing FPGAs with IoT-based edge devices, IoT-FPGA based applications, Microsemi's SmartFusion2 SoC FPGA.

UNIT-IV : IoT Enabling Technologies and Devices

9

Big data, Digital twin, Cloud Computing, Sensors, Communications, Analytical software, Edge Devices.

UNIT-V : Security in Cognitive IoT

9

Security in Cognitive IoT, Security Issues in IoT, A hardware assisted approach for security, Architectural level overview for providing security, Security threats. IoT and Edge Security, Physical and hardware security, Shell security, Cryptography, Software-Defined Perimeter, Blockchains and cryptocurrencies in IoT, Government regulations and intervention.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- CO1 :** Integrate the aspects of human cognitive processes in the system design
- CO2 :** Comprehend the underlying cognitive process can have many abstractions of a cognitive cycle such as 'Sense', 'Understand', 'Decide' and 'Act'.
- CO3 :** Detect any failures of system components and re-configure itself which provides a graceful degradation through self-healing.
- CO4 :** Accomplish knowledge about the application, system architecture, resources, system state and behavior.
- CO5 :** Analyze security issues in IoT applications

TEXT BOOKS:

1. Matin, Mohammad Abdul, ed. Towards Cognitive IoT Networks, 1st edition ,Springer International Publishing, 2020.
2. "IoT and Edge Computing for Architects" Perry Lea,"-second edition, Packt, March,2020.
3. "Secure EdgeComputing: Applications, Techniques and Challenges", Mohiuddin Ahmed (Editor), Paul Haskell-Dowland (Editor), CRC press, first edition, August 2021.

REFERENCES:

1. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange and Stefan Meissner, Enabling things to talk –Designing IoT solutions with the IoT Architecture Reference Model, 1st edition ,Springer Open, 2016
2. John Mutumba Bilay, Peter Gutsche, Mandy Krimmel and Volker Stiehl, SAP Cloud Platform Integration: The Comprehensive Guide, 2nd edition, Rheinwerg publishing.2019.

3. Mahalle, Parikshit Narendra, and Poonam N. Railkar, Identity management for internet of things, 1st edition , River Publishers, 2015.

WEBSITE REFERENCES :

1. <https://learn.microsoft.com/en-us/training/modules/run-cognitive-services-iot-edge/>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO12	PSO1	PSO2
CO1	3	3	3	3		2	2	2						
CO2	3	3	3	3										
CO3	3	3	3	3		1	1	1						
CO4	3	3	3	3		1	1	1						
CO5	3	3	3	3										
AVG	3	3	3	3		2	2	2						

JIT2016	PRIVACY SECURITY FOR IoT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Realize IoT security requirements and management tools
- To know the state-of-the-art methodologies in Cyber Physical system.
- To impart knowledge on Model threats and countermeasures.
- To explore the Privacy Preservation and Trust Models in Internet of Things (IoT)
- To apply the concept of Internet of Things Security in the real world scenarios

UNIT-I : INTRODUCTION: SECURING THE INTERNET OF THINGS 9

Introduction – Security Requirements in IoT architectures – Security in Enabling Technologies – IoT Security Life Cycle – Cryptographic Fundamentals for IoT Security Engineering - Security Concerns in IoT Applications – Basic Security Practices.

UNIT-II: SECURITY ARCHITECTURE IN THE INTERNET OF THINGS 9

Introduction – Security Requirements in IoT – Insufficient Authentication/Authorization – Insecure Access Control – Threads to Access Control, Privacy, and Availability – Attacks Specific to IoT – Malware Propagation and Control in Internet of Things.

UNIT-III : PRIVACY PRESERVATION**9**

Privacy Preservation Data Dissemination - Privacy Preservation for IoT used in SmartBuilding – Exploiting Mobility Social Features for Location Privacy Enhancement in Internet of Vehicles – Lightweight and Robust Schemes for Privacy Protection in Key personal IOT Applications: Mobile WBSN and Participatory Sensing.

UNIT-IV :TRUST, AUTHENTICATION AND DATA SECURITY**9**

Trust and Trust Models for IoT – Emerging Architecture Model for IoT Security and Privacy – preventing Unauthorized Access to Sensor Data – Authentication in IoT – Computational Security for the IoT – Secure Path Generation Scheme for real-Time Green IoT – Security Protocols for IoT Access Networks

UNIT-V: SOCIAL AWARENESS AND CASE STUDIES**9**

User Centric Decentralized Governance Framework for Privacy and Trust in IoT – Policy Based Approach for Informed Consent in IoT - Security and Impact of the IoT on Mobile Networks – Security Concerns in Social IoT – Security for IoT Based Healthcare – Smart cities.

TOTAL: 45 HOURS**COURSE OUTCOMES:****At end of the course students will be able to:****CO1 :**Describe the basics of securing Internet of Things.**CO2 :**Explain architecture and threats in IoT.**CO3 :**Analyze various privacy schemes related to IoT**CO4 :** Describe the authentication mechanisms for IoT security and privacy.**CO5 :** Explain security issues for various applications using case studies**TEXT BOOKS:**

1. Shancang Li, Li Da Xu, “Securing the Internet of Things,” Syngress (Elsevier) publication, 2017, ISBN: 978-0-12-804458-2.

2. Fei Hu, “Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations,” CRC Press (Taylor & Francis Group), 2016, ISBN:978-1-4987- 23190.

3. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A Hands-on approach,” VPT

Publishers, 2014, ISBN: 978-0996025515.

REFERENCES:

1. Alasdair Gilchris, “Iot Security Issues,” Walter de Gruyter GmbH & Co, 2017.
2. Sridipta Misra, Muthucumaru Maheswaran, Salman Hashmi, “Security Challenges and Approaches in Internet of Things,” Springer, 2016.
6. Brian Russell, Drew Van Duren, “Practical Internet of Things Security,” Packet Publishing Ltd, 2016.

WEBSITE REFERENCES :

1. https://onlinecourses.nptel.ac.in/noc22_cs23/preview
2. <https://www.coursera.org/lecture/m2m-iot-interface-design-embedded-systems/iot-ecurity/>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	3	1	-	-	2	2
CO2	3	3	3	2	2	-	-	1	1	2	3	2
CO3	3	3	2	3	1	-	-	1	-	1	2	2
CO4	3	3	3	2	2	-	-	1	1	2	3	2
CO5	3	3	3	3	2	1	1	2	-	2	2	2
AVG	3	3	3	2.0	2	-	2	1	1	2	2	2

LIST OF OPEN ELECTIVES

Sl. No	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
SEMESTER –IV							
1.	JAD9101	Introduction to Data Science	3	3	0	0	3
2.	JAD 9102	Basics of Machine learning	3	3	0	0	3
SEMESTER –V							
3.	JAD 9103	Basics of Data Exploration	3	3	0	0	3
4.	JAD 9104	Data Warehousing	3	3	0	0	3
SEMESTER –VI							
5.	JAD 9105	Introduction to R programming	3	3	0	0	3
6	JAD 9106	Basics of Data Security	3	3	0	0	3
SEMESTER –VII							
7.	JAD 9107	Basics of Game development	3	3	0	0	3
8.	JAD 9108	Basics of Automation Tools in Software Testing	3	3	0	0	3

SEMESTER –IV

JAD9101	INTRODUCTION TO DATA SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To equip students with a thorough understanding of the data science process, key roles, and data operations
- To describe Understand Correlation and Scatter Plots
- To explain Matplotlib library and its various modules to create a wide range of visualizations.
- To sketch the basics of NumPy arrays, including creation, indexing, slicing, and reshaping operations.
- To provide a comprehensive understanding of models, induction, prediction techniques, and their practical applications

PREREQUISITE:

- NIL

UNIT I	INTRODUCTION	9
Data Science Process, roles, stages in data science project, working with data from files, working with relational data, Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.		
UNIT II	DESCRIBING RELATIONSHIPS	9
Correlation- Scatter plots- correlation coefficient for quantitative data- computational formula for correlation coefficient- Regression- regression lines - least squares regression line- Standard error of estimate- interpretation of r ² - multiple regression equations- regression towards the mean		
UNIT III	DATA VISUALIZATIONS	9
Importing Matplotlib- Line plots- Scatter plots- visualizing errors- density and contour plots- Histograms- legends- colors- subplots- text and annotation- customization- three dimensional plotting- Geographical Data with Basemap- Visualization with Seaborn		
UNIT IV	PYTHON LIBRARIES FOR DATA WRANGLING	9
Basics of Numpy arrays- aggregations- computations on arrays- comparisons, masks, boolean logic- fancy indexing- structured arrays- Data manipulation with Pandas- data indexing and selection- operating on data- missing data- Hierarchical indexing- combining datasets- aggregation and grouping- pivot tables.		
UNIT V	PREDICTIVE MODELING	9
Models, Induction and Prediction- Visualizing Segmentations- Trees as Sets of Rules- Probability Estimation- Fitting a model to Data: Classification via Mathematical Functions- Regression via Mathematical Functions- Class Probability Estimation and Logistic Regression		

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Articulate the stages of the data science lifecycle
- Explain the concept of correlation and its significance in data analysis.
- Utilize the Matplotlib library to create basic visualizations
- Perform indexing and slicing operations on NumPy arrays to access and manipulate data efficiently.
- Explain Models, Induction, and Prediction Techniques

TEXT BOOKS:

1. Joel Grus, “Data Science from Scratch: First Principles with Python” , O'Reilly Media, 2015.
2. Jake. VanderPlas, “ Python Data Science Handbook: Essential Tools for Working with Data”, O'Reilly Media, 2016.

REFERENCES:

1. Armando Fandango, “Python Data Analysis” , Second Ed., Packt Publishing, ISBN: 9781787127487
2. Navlani, Avinash., Fandango, Armando., Idris, Ivan. “Python Data Analysis: Perform Data Collection, Data Processing, Wrangling, Visualization, and Model Building Using Python”, Packt Publishing, 2021.

WEB REFERENCES:

- <https://mitpress.mit.edu/sites/default/files/sicp/>
- <https://github.com/rstudio/rmarkdown>
- <https://doi.org/10.2307/2682899>
- <https://magrittr.tidyverse.org>

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	2	-	-	-	-	-	-	2
CO2	3	3	2	1	-	-	-	-	-	-	-	1
CO3	3	3	3	3	3	1	-	-	-	-	-	1
CO4	3	3	3	3	3	1	-	-	-	-	-	1
CO5	3	3	2	3	3	1	-	-	-	-	-	1
AVG	3	3	2.6	2	2.2	0.6	-	-	-	-	-	1.2

JAD9102	BASICS OF MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the basic concepts of machine learning.

- To define and build supervised learning models.
- To discuss and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified
- To understand the design techniques of Machine learning

PREREQUISITE:

- NIL

UNIT I INTRODUCTION TO MACHINE LEARNING	9
Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.	
UNIT II SUPERVISED LEARNING	9
Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, Linear Classification Models: Discriminant function -Probabilistic discriminative model - Logistic regression,– Naïve Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests	
UNIT III UNSUPERVISED LEARNING	9
Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization	
UNIT IV NEURAL NETWORKS	9
Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks	
UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS	9
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.	

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Explain the basic concepts of machine learning.
- Construct supervised learning models.
- Construct unsupervised learning algorithms.
- Understand the concepts of different neural network

[illegible]

SEMESTER –V

JAD9103	BASICS OF DATA EXPLORATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data

PREREQUISITE:

- PYTHON PROGRAMMING

UNIT I INTRODUCTION	9
Exploratory data analysis (EDA) fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.	
UNIT II EDA USING PYTHON	9
Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations.	
UNIT III UNIVARIATE ANALYSIS	9
Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.	
UNIT IV BIVARIATE ANALYSIS	9
Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.	
UNIT V MULTIVARIATE AND TIME SERIES ANALYSIS	9
Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Timebased indexing – Visualizing – Grouping – Resampling.	

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Describe the fundamentals of exploratory data analysis
- Implement the data visualization using Matplotlib.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.
- Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017.
3. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008.

REFERENCES:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015.

WEB REFERENCES:

- <https://www.youtube.com/watch?v=q4pyaVZjqk0>
- https://www.youtube.com/watch?v=W_luaRckM8g
- <https://www.youtube.com/watch?v=eFByJkA3ti4>
- <https://www.youtube.com/watch?v=oskDpBfxBEI>
- <https://www.youtube.com/watch?v=OY4eQrekQvs>

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	-	-	-	2	2	3	2
CO2	2	2	2	3	3	-	-	-	3	2	2	2
CO3	2	3	2	2	3	-	-	-	2	2	2	1
CO4	2	2	2	2	3	-	-	-	3	2	2	1
CO5	2	2	3	2	1	-	-	-	1	2	2	1
AVG	2.2	2.2	2.4	2.4	2.6	-	-	-	2.2	2	2.2	1.4

JAD9104	DATA WAREHOUSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Outline the details of data warehouse Architecture
- To Explain the OLAP Technology
- To describe the partitioning strategy
- To equip students with a comprehensive understanding of metadata management and data marts
- To Explain the roles of process manager & system manager

PREREQUISITE:

- NIL

UNIT I INTRODUCTION TO DATA WAREHOUSE	9
Data warehouse Introduction – Data warehouse components- operational database Vs data warehouse – Data warehouse Architecture & Principles– Three-tier Data Warehouse Architecture – Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake – Modern Data Warehouse	
UNIT II ETL AND OLAP TECHNOLOGY	9
Types of Data Warehouse - Data Warehouse Design and Modeling -Delivery Process -Online Analytical Processing(OLAP) -Characteristics of OLAP- Online Transaction Processing Vs OLAP- OLAP Operations-Types of OLAP	

UNIT III META DATA, DATA MART AND PARTITION STRATEGY**9**

Meta Data – Categories of Metadata – Role of Metadata – Metadata Repository – Challenges for Meta Management – Data Mart – Need of Data Mart- Cost Effective Data Mart- Designing Data Marts- Cost of Data Marts- Partitioning Strategy – Vertical partition – Normalization – Row Splitting – Horizontal Partition

UNIT IV DIMENSIONAL MODELLING AND SCHEMA**9**

Dimensional Modelling Multi – Dimensional Data Modelling Data Cube – Star Schema – Snowflake Schema – Star Vs Snowflake Schema – Fact Constellation Schema – Schema Definition – Process Architecture - Types of Data Base Parallelism – Datawarehouse Tools

UNIT V SYSTEM & PROCESS MANAGERS**9**

Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager – System Event Manager – System Database Manager – System Backup Recovery Manager – Data Warehousing Process Managers: Load Manager – Warehouse Manager- Query Manager - Case Studies: Retail, Banks, & Education

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

At the end of the course, the student should be able to:

- Design data warehouse architecture for various Problems
- Apply the OLAP Technology
- Analyse the partitioning strategy
- Analyze the differentiation of various schema for given problem
- Frame roles of process manager & system manager

TEXT BOOKS:

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. 2. Ralph Kimball, “The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling”, Third edition, 2013.

REFERENCES:

1. Paul Raj Ponniah, “Data warehousing fundamentals for IT Professionals”, 2012.
2. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.

WEB REFERENCES:

- <https://www.javatpoint.com/data-warehouse>
- <https://www.tutorialspoint.com/dwh/index.htm>

- https://www.brainkart.com/article/Data-warehousing_6059/

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	-	-	3	-	-	3
CO2	3	2	2	2	3	-	-	-	2	-	2	2
CO3	3	3	3	3	-	-	-	-	-	-	-	3
CO4	3	3	3	3	-	-	-	-	-	-	-	3
CO5	3	2	2	2	-	-	-	-	-	-	2	2
AVG	3	2.2	2.4	2.4	2.6	-	-	-	2.2	2	2.2	1.4

SEMESTER –VI

JAD9105	INTRODUCTION TO R PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To describe basics of R programming.
- To Implement control flow mechanisms of R programming.
- To effectively visualize data, tailor graphical outputs to specific needs
- To demonstrate statistical testing using R- Programming
- To design and build Linear optimization on data

PREREQUISITE:

- NIL

UNIT I INTRODUCTION OF R-LANGUAGE	9
Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, DataTypes, Vectors, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays,Classes..	
UNIT II FUNCTIONS AND STRUCTURES	9
R Programming Structures, Control Statements, Loops, - Looping Over Non-vector Sets, If-Else, Arithmetic and Boolean Operators, Default Values for Argument, Return Values, Functions with No Pointers in R, Recursion, Sorting and Searching	

UNIT III R-BASE GRAPHICS	9
Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function Customizing Graphs, Saving Graphs to Files.	
UNIT IV T-TESTING	9
Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.	
UNIT V LINEAR OPTIMIZATION	9
Linear Models, Simple Linear Regression and Multiple Regression, Generalized Linear Models, Nonlinear Models, Splines- Decision- Random Forests.	

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate a solid understanding of R's fundamental concepts, including data types, data structures, and basic functions.
- Apply control flow statements such as if-else, for, while, and repeat loops to manage the execution flow of R scripts.
- Create various types of graphs, including histograms, bar charts, line graphs, and scatter plots, to effectively visualize data.
- Perform statistical tests such as hypothesis testing, t-tests, and chi-square tests to analyze data and derive insights.
- Formulate linear optimization problems using appropriate mathematical models.

TEXT BOOKS

1. Matloff, Norman S. "The Art of R Programming: A Tour of Statistical Software Design" Nigeria, No Starch Press, 2011.
2. Gillespie, C., Lovelace, R. "Efficient R Programming: A Practical Guide to Smarter Programming" ,United States: O'Reilly Media,2016

REFERENCES:

1. Lander, Jared. "R for Everyone: Advanced Analytics and Graphics", Pearson Education, 2017..
2. Kabacoff, Robert I "R in Action: Data Analysis and Graphics with R" , Manning, 2015.

WEB REFERENCES:

- https://www.tutorialspoint.com/r/r_tutorial

- <https://www.codecademy.com/learn/learn-r>
- https://onliecourses.nptel.ac.in/noc19_ma33/

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	-	-	-	2	2	3	2
CO2	2	2	2	3	3	-	-	-	3	2	2	2
CO3	2	3	2	2	3	-	-	-	2	2	2	1
CO4	2	2	2	2	3	-	-	-	3	2	2	1
CO5	2	2	3	2	1	-	-	-	1	2	2	1
AVG	2.2	2.2	2.4	2.4	2.6	-	-	-	2.2	2	2.2	1.4

JAD9106	BASICS OF DATA SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the various types of crimes, threats and attacks in data.
- To describe the threats and risks within the context of data security.
- To outline the various digital laws and the concepts of digital forensics.
- To develop the defensive techniques against these attacks.

PREREQUISITE:

- Basic knowledge of Data Handling

UNIT I	INTRODUCTION TO DATA SECURITY	9
Basic Data Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Data Threats-Digital Warfare, Digital Crime, Digital terrorism, Digital Espionage, etc., Comprehensive Data Security Policy.		
UNIT II	DIGITAL SPACE AND THE LAW AND DIGITAL FORENSICS	9

Introduction, Data Security Regulations, Roles of International Law. The Indian Digital Data Space, National Data Security Policy. Introduction, Historical background of Digital forensics, Digital Forensics Science, The Need for Computer Forensics, Digital Forensics and evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Digital Forensics		
UNIT III	MOBILE DATA CRIMES	9
Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.		
UNIT IV	DIGITAL DATA SECURITY	9
Organizational Implications: Introduction, cost of digital crimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.		
UNIT V	DATA PRIVACY ISSUES	9
Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc		

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the digital data attacks and the types of digital data crimes
- Apply data security laws and also defend and protect themselves and the entire Internet community from such attacks.
- Review and report forensically investigate security incidents.
- Apply policies and procedures to manage Privacy issues.
- Design and develop secure software modules

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, “Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives”, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. James Graham, Richard Howard and Ryan Otson, "Cyber Security Essentials", CRC Press.
2. Chwan-Hwa(john) Wu, J. David Irwin, "Introduction to Cyber Security", CRC Press T&F Group.

WEB REFERENCES:

- www.csoonline.com/article/2130877/data-protection/data-protection-the-15-worst-data-security-breaches-of-the-21st-century.html
- <https://haveibeenpwned.com>
- <http://stateofthemedias.org/2012/audio-how-far-will-digital-go/audio-by-the-numbers/>
- <http://thenextweb.com/insider/2012/12/24/belgian-rail-firm-sncb-europe-sees-1-5m-customer-details-leaked-but-fails-to-take-responsibility/>

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	-	-	-	2	2	3	2
CO2	2	2	2	3	3	-	-	-	3	2	2	2
CO3	2	3	2	2	3	-	-	-	2	2	2	1
CO4	2	2	2	2	3	-	-	-	3	2	2	1
CO5	2	2	3	2	1	-	-	-	1	2	2	1
AVG	2.2	2.2	2.4	2.4	2.6	-	-	-	2.2	2	2.2	1.4

SEMESTER –VII

JAD9107	BASICS OF GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the basics of 2D and 3D graphics for game development.
- To specify the stages of game development.
- To discuss the basics of a game engine.
- To explain the gaming development environment and tool kits.
- To explain development simple games using Pygame environment.

PREREQUISITE:

- NIL

UNIT I 3D GRAPHICS FOR GAME DESIGN	9
Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.	
UNIT II GAME DESIGN PRINCIPLES	9
Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.	
UNIT III GAME ENGINE DESIGN	9
Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.	
UNIT IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS	9
Pygame Game development – Unity – Unity Scripts – Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.	
UNIT V GAME DEVELOPMENT USING PYGAME	9
Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.	

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Explain the concepts of 2D and 3d Graphics.
- Design game design documents.
- Design and Implement of gaming engines.
- Survey gaming environments and frameworks.
- Implement a simple game in Pygame

TEXT BOOKS:

1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison Wesley, 2013.

2. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress, 2007.
3. Paul Craven, "Python Arcade games", Apress Publishers, 2016.

REFERENCES:

1. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics", Second Edition, CRC Press, 2006.
2. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 2011.
3. Alan Thorn, "Game Development Principles", Wiley, 2018.
4. Mike McShaffry, "Game Coding Complete", Cengage Learning, 2018.
5. Jeremy Gibson Bond, "Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#", Addison-Wesley Professional, 2017.

WEB REFERENCES:

- <https://www.youtube.com/watch?v=7C92ZCnlmQo>
- <https://www.youtube.com/watch?v=U9vqzH65Zzw>
- <https://developer.android.com/games/agde>
- <https://www.youtube.com/watch?v=rJ1iA-33fss>

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	-	-	-	-	-	-	-
CO2	1	2	2	1	2	-	-	-	-	-	-	-
CO3	1	1	1	2	1	-	-	-	-	-	-	-
CO4	3	3	1	3	3	-	-	-	-	-	-	-
CO5	3	3	2	1	3	-	-	-	-	-	-	-
AVG	2.2	2.2	1.6	1.6	2.2	-	-	-	-	-	-	-

JAD9108	BASICS OF AUTOMATION TOOLS IN SOFTWARE TESTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the basics of software testing
- To describe and build test cases and execute them
- To focus on wide aspects of testing and understanding multiple facets of testing
- To specify test automation techniques and metrics

- To explain an insight into test automation tools used for test automation

PREREQUISITE:

- NIL

UNIT I FOUNDATIONS OF SOFTWARE TESTING	9
Software Testing Life Cycle, V-model of Software Testing, Software Testing Principles, The Tester's Role in a Software Development Organization – Basic definitions – Failures, Errors and Faults, Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design	
UNIT II TEST CASE DESIGN STRATEGIES	9
Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Using White Box Approach to Test design – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs	
UNIT III LEVELS OF TESTING	9
Need for Levels of Testing – Unit Test – Unit Test Planning – The Test Harness – Running the Unit tests and Recording results – Integration tests – Integration Test Planning, System Testing – Acceptance testing – Performance testing – Regression Testing	
UNIT IV TEST AUTOMATION & METRICS	9
Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics	
UNIT V TEST AUTOMATION TOOLS	9
Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Test Reports.	

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the basic concepts of software testing and the need for software testing
- Design effective test cases that can uncover critical defects in the application
- Carry out advanced types of testing
- Understand the knowledge about the test metrics and measurements
- Automate the software testing using Selenium and Testing

TEXT BOOKS:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, 2012
2. Unmesh Gundecha, Satya Avasarala, “Selenium WebDriver 3 Practical Guide” – Second Edition, 2018
3. Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing – Principles and Practices, Pearson Education, 2006

REFERENCES:

1. Glenford J. Myers, Corey Sandler, Tom Badgett, “ The Art of Software Testing”, 3rd Edition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, “Software testing”, 2nd Edition, 2006, Sams Publishing
3. Paul C. Jorgensen, “Software Testing: A Craftsman’s Approach”, Fourth Edition, 2014, Taylor & Francis Group.
4. Carl Cocchiaro, “Selenium Framework Design in Data-Driven Testing”, 2018, Packt Publishing.
5. Elfriede Dustin, Thom Garrett, Bernie Gaurf, “Implementing Automated Software Testing”, 2009, Pearson Education, Inc.
6. SatyaAvasarala, “Selenium Web Driver Practical Guide”, 2014, Packt Publishing.

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- https://www.tutorialspoint.com/software_testing_dictionary/test_execution.htm
- <https://www.javatpoint.com/automation-testing-tool>
- <https://www.guru99.com/automated-testing-tools.html>

Mapping of CO with PO/PSO

	PROGRAM OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	2	-
CO2	3	3	3	-	-	-	-	-	3	3	-	2
CO3	3	3	3	-	3	-	-	-	3	3	-	2
CO4	-	2	-	-	2	-	-	2	3	-	-	3
CO5	3	3	3	-	2	2	-	2	3	3	2	3
AVG	3	2	3	-	2.7	2	-	2	3	3	2	2.5

