



**SRI VENKATESWARA COLLEGE OF ENGINEERING,**

**(An Autonomous Institution, Affiliated to Anna University, Chennai – 600025)**

## **B. Tech. Artificial Intelligence and Data Science**

***CURRICULUM AND SYLLABUS  
REGULATION – 2022  
CHOICE BASED CREDIT SYSTEM***

Curriculum Revision No:	Board of Studies recommendation date :	Academic Council Approved date:
Salient Points of the revision	01.	The courses "Scientific Thoughts in Tamil" in Semester I and "Heritage of Tamil" in Semester II are introduced as per the recommendations of Anna University/Government of Tamil Nadu.
	02.	The course " Technical Drawing " is introduced in Semester-II in place of "Engineering Drawing" of R2018.
	03.	The Course Object Oriented Programming and Paradigm is updated with Java along with C++ in R18
	04.	Digital Systems Theory and Lab shifted to Semester III
	05.	Communication Skills development is ensured through Communicative English and Induction Programme

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REGULATIONS 2022

**B.Tech ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

CHOICE BASED CREDIT SYSTEM

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

**Artificial Intelligence and Data Science program will prepare its graduates:**

1. To solve real-world issues by developing intelligent computing systems to meet the emerging technology challenges in the industries.
2. To apply professional and interpersonal skills through lifelong learning such as advanced degrees and research.
3. To participate in collaborative learning and become successful entrepreneurs by ensuring ethical and moral values.

**PROGRAM OUTCOMES (POs)**

**POGRADUATE ATTRIBUTES**

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

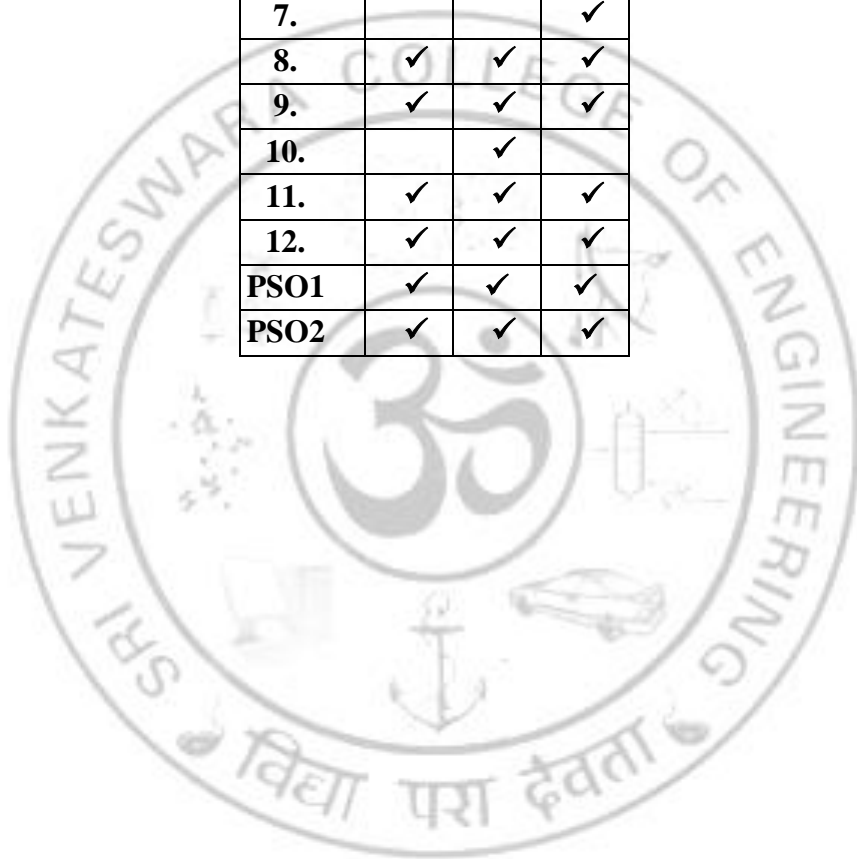
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### **PROGRAM SPECIFIC OUTCOMES (PSOs)**

1. Apply the engineering concepts and evolve Artificial Intelligence-based models to solve real-world problems in various domains and deliver solutions with innovative ideas.
2. Apply the concepts and algorithms of various learning models for deep analysis of data to provide high-end business decisions for advancement in the data science fields.

**PEO's – PO's& PSO's MAPPING: (Example)**

POs	PEOs		
	I	II	III
1.	✓	✓	✓
2.	✓		✓
3.	✓	✓	
4.			✓
5.	✓	✓	✓
6.	✓	✓	✓
7.			✓
8.	✓	✓	✓
9.	✓	✓	✓
10.		✓	
11.	✓	✓	✓
12.	✓	✓	✓
PSO1	✓	✓	✓
PSO2	✓	✓	✓



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**REGULATIONS 2022**  
**CHOICE BASED CREDIT SYSTEM**

**B. Tech ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

**CURRICULUM FOR SEMESTERS I TO III AND SYLLABI**  
**FOR SEMESTERS I AND III**

**SEMESTER I**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQUISITE	POSITION
				L	T	P	C			
1.	IP22151	Induction Programme (Common to all Branches)		-	-	-	-	-	Nil	F
<b>Theory Subjects</b>										
2.	HS22151	Tamil language and Heritage of Ancient Tamil Society (Common to all Branches)	MC	1	0	0	1	1	NIL	F
3.	HS22152	Communicative English (Common to all Branches)	HS	3	0	0	3	3	NIL	F
4.	MA22151	Applied Mathematics I (Common to all Branches except MR)	BS	3	1	0	4	4	NIL	F
5.	PH22151	Applied Physics (Common to AD, CS, EE, EC, IT)	BS	3	0	0	3	3	NIL	F
6.	CY22151	Applied Chemistry (Common to AD, CS, EE, EC, IT)	BS	3	0	0	3	3	NIL	F
7.	EE22151	Basic Electrical and Electronics Engineering (Common to all Branches except CH, EE, EC)	ES	3	0	0	3	3	NIL	F
8.	IT22101	Programming for Problem Solving (Common to IT, AD, CS, EE, EC)	ES	3	0	0	3	3	NIL	F
<b>Practical Subjects</b>										
9.	PH22161	Physics Laboratory (Common to all Branches except BT)	BS	0	0	2	1	2	NIL	F
10.	EE22111	Basic Electrical and Electronics Engineering Laboratory (Common to all Branches except EC)	ES	0	0	2	1	2	NIL	F
11.	IT22111	Programming for Problem Solving Laboratory (Common to IT, AD, CS, EE, EC)	ES	0	0	3	1.5	3	NIL	F
<b>Total</b>				<b>19</b>	<b>1</b>	<b>7</b>	<b>23.5</b>	<b>27</b>	-	-

**SEMESTER II**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQUISITE	POSITION
				L	T	P	C			
<b>Theory Subjects</b>										
1.	HS22251	Science and Technology in Ancient Tamil Society (Common to all Branches)	HS	2	0	0	2	2	NIL	F
2.	HS22252	Technical English (Common to all Branches)	BS	3	0	0	3	3	NIL	F
3.	MA22251	Applied Mathematics II (Common to all Branches except MR)	BS	3	1	0	4	4	NIL	F
4.	ME22251	Technical Drawing (Common to AD, CS, IT)	BS	1	0	2	2	3	NIL	F
5.	MA22253	Mathematics for Data Science	ES	3	1	0	4	4	NIL	F
6.	AD22201	Data Structures and Algorithm Analysis	PC	3	0	0	3	3	NIL	F
7.	AD22202	Object Oriented Paradigm and Programming	MC	3	0	0	3	3	NIL	F
<b>Practical Subjects</b>										
8.	AD22211	Data Structures and Algorithm Analysis Laboratory	PC	0	0	3	1.5	3	NIL	F
9.	AD22212	Object Oriented Paradigm and Programming Laboratory	PC	0	0	3	1.5	3	NIL	F
<b>Total</b>				<b>18</b>	<b>2</b>	<b>8</b>	<b>24</b>	<b>28</b>	-	-

**SEMESTER III**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQUISITE	POSITION
				L	T	P	C			
<b>Theory Subjects</b>										
1.	MA22356	Statistics for Data Science	BS	3	1	0	4	4	Nil	F
2.	AD22301	Artificial Intelligence (Common to AD & CS)	PC	3	0	0	3	3	Nil	F
3.	CS22301	Database Management Systems (Common to CS & AD)	PC	3	0	0	3	3	Nil	F
4.	CS22302	Datamining and Data warehouse (Common to CS & AD)	PC	3	0	0	3	3	Nil	F
5.	CS22201	Python For Data Science (Common to CS & AD)	PC	3	0	2	4	5	Nil	F
6.	CS22202	Digital Principles and System Design (Common to CS & AD)	PC	3	0	0	3	3	Nil	F
<b>Practical Subjects</b>										
7.	CS22311	Database Management Systems Laboratory (Common to CS & AD)	PC	0	0	3	1.5	3	Nil	F
8.	AD22311	Artificial Intelligence Laboratory	PC	0	0	3	1.5	3	Nil	F
<b>Total</b>				<b>18</b>	<b>1</b>	<b>8</b>	<b>23</b>	<b>27</b>	-	-

HS22151

தமிழ் மொழியும் தமிழர் மரபும்  
TAMIL LANGUAGE AND HERITAGE OF  
TAMILS

(Common to all Branches)

L	T	P	C
1	0	0	1

பாடத்தின் நோக்கங்கள் :

- தமிழ் மொழியின் தோற்றம் பற்றியும், திணை கருத்துக்கள் வாயிலாக வாழ்வியல் முறைகளை பற்றியும் கற்றுக் கொள்வார்கள்.
- இந்திய தேசிய சுதந்திர இயக்கத்தில் தமிழர்களின் பங்களிப்பு மற்றும் தமிழர்களின் மேலாண்மை முறைகளை பற்றியும் கற்றுக் கொள்வார்கள்.

**OBJECTIVES:**

- They will learn about the origin of the Tamil language and the ways of life through five types of lands.
- They will also learn about the contribution of Tamils in the Indian National Freedom Movement and the management methods of Tamils.

**அலகு 1 தமிழுக்கும் தொழில்நுட்பக் கல்விக்கும் உள்ள தொடர்பு 3**  
**மொழி மற்றும் பாரம்பரியம்:** இந்தியாவில் உள்ள மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழில் செம்மொழி இலக்கியம் - உ.வே. சாமிநாதய்யர். ஆறுமுகநாவலர் ஆகியோரின் பங்களிப்பு - தொழில் நுட்பக் கல்வியில் தமிழ் மொழியின் முக்கியத்துவம்.

**UNIT I LANGUAGE AND HERITAGE**

**Language families in India** – Dravidan Languages – Tamil as a Classical language – Classical Literature in Tamil – Contribution of U. Ve. Saminathaiyar. Arumuka Navalar – Importance of Tamil language in technical education.

**அலகு 2 திணை கருத்துக்கள் 9**  
திணை கருத்துக்கள்: -ஐந்து வகை நிலங்கள், விலங்குகள், கடவுள்கள், தொழில், வாழ்க்கை முறைகள், இசை, நடனம், உணவு முறை, தமிழர்களின் தாவரங்கள் மற்றும் விலங்கினங்கள் – தொல்காப்பியம் மற்றும் சங்க இலக்கியங்களில் இருந்து அகம் மற்றும் புரம் கருத்து – தமிழ் பற்றிய அறம் கருத்து – கல்வி மற்றும் எழுத்தறிவு சங்க காலம் – சங்ககாலத்தின் பண்டைய நகரங்கள் மற்றும் துறைமுகங்கள் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – சோழர்களின் வெளிநாட்டு வெற்றி.

**UNIT II THINAI CONCEPTS**

Five types of lands, animals, Gods, occupation, life styles, music, dance , food style, Floara and Fauna of Tamils - Agam and puram concept from Tholkappiyam and Sangam Literature – Aram concept of Tamil – Education and Literacy during Sangam Age – Ancient cities and Ports of Sangam Age – Export and Import during Sangam Age - Overseas Conquest of Choloas.



இந்திய தேசிய சுதந்திர இயக்கம் மற்றும் இந்திய கலாச்சாரத்திற்கு தமிழர்களின் பங்களிப்பு:- சுப்ரமணிய பாரதி, வாஞ்சிநாதன், சுப்பிரமணிய சிவா, வீரபாண்டிய கட்ட பொம்மன், வா..ஊ சிதம்பரம் பிள்ளை, தீரன் சின்னமலை, மருது பாண்டிய சகோதரர்கள், பூலி தேவர், திருப்பூர் குமரன், வீரமங்கை வேலு நாச்சியார் - .தமிழர் இலக்கியங்களில் மேலாண்மை கருத்துக்கள் (கி. மு. 500 முதல் கி. பி 200 வரை) – அகநானூறு, புறநானூறு, திருக்குறள் ஆகியவற்றில் மேலாண்மைக் கருத்துக்கள்.

### UNIT -3 HERITAGE OF TAMILS

**Contribution of Tamils to Indian National Freedom Movement and Indian Culture:** Contributions of Subramanya Bharathi, Vanchinathan, Subramaniya Siva, Veerapandiya Kattabomman, V O Chidambaram Pillai, Dheeran Chinnamalai, The Maruthu Pandiyar, Puli Thevar, Tiruppur Kumaran, Veera Mangai Velunachiyar.

**TOTAL : 15 PERIODS**

பாடநெறி முடிவுகள் :  
**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	மாணவர்கள் தமிழ் மொழித் தோற்றம் பற்றித் தெரிந்து கொள்வார்கள். Students will learn about the origin of the Tamil language	1
CO2	தமிழர்களின் வாழ்வியல் முறைகளைத் தெரிந்து கொள்வார்கள். They will know the ways of life of Tamils.	2
CO3	தமிழர்களின் சுதந்திர போராட்ட வீரர்களை பற்றியும், மேலாண்மைகளை பற்றியும் தெரிந்து கொள்வார்கள். They will know about the freedom fighters of Tamils and the management of Tamils	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

பாடநூல்கள்:  
**REFERNCES:**

1. பொன். முத்துகுமாரன் (2002), “தமிழ் மரபு”, காந்தளகம், 68, அண்ணா சாலை, சென்னை 600 002
2. பி. டி. ஸ்ரீனிவாச ஜயங்கார் (தமிழக்கமும் திறனாய்வும்) புலவர் கா. கோவிந்தன் (1988), “தமிழர் வரலாறு (முதல் பகுதி)”, திருநெல்வேலி தென்னிந்திய சைவ சித்தாந்த நூற்பதிப்பு கழகம் ,154, TTK சாலை, சென்னை 18.
3. டாக்டர். கே. கே. பிள்ளை (2009), “தமிழக வரலாறு மக்களும் பண்பாடும்”, உலக தமிழாராய்ச்சி நிறுவனம், தரமணி , சென்னை 600113
4. முனைவர். ச. இராஜேந்திரன் (2004), “தமிழில் சொல்லாக்கம்”, தஞ்சாவூர் தமிழ் பல்கலைக் கழகம் வெளியீடு

**COURSE ARTICULATION MATRIX:**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	3	-	3	3	2	-	3	3	-	2	-	-
2	-	-	3	2	3	3	-	1	3	3	-	-	-	-
3	-	-	3	2	3	3	2	-	3	3	-	2	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation



HS22152

**COMMUNICATIVE ENGLISH**

(Common to all Branches)

L	T	P	C
2	1	0	3

**OBJECTIVES**

- Enable learners to interact fluently on everyday social contexts.
- Train learners to engage in conversations in an academic/scholarly setting.
- Instil confidence in learners to overcome public speaking barriers.
- Develop learners' ability to take notes and in the process, improve their listening skills
- Enhance learners' reading skill through reading text passages for comprehension and contemplation.
- Improve learners' skills to write on topics of general interest and drafting correspondences for general purposes.

**UNIT I**

9

Listening - short video clips - conversational scenes from movies, celebrities' speeches /interviews. Speaking - several ways of introducing oneself at several situations, introducing others at several situations, inviting people for several occasions, describing people and their places. Reading - short comprehension passages - making inferences, critical analysis. Writing - completing the incomplete sentences - developing hints from the given information. Grammar - Wh-Questions and Yes or No questions - Parts of speech. Vocabulary development - prefixes - suffixes - articles - countable / uncountable nouns.

**UNIT II**

9

Listening - customer care voice files, short narratives - identifying problems and developing telephone etiquettes. Speaking - speaking over skype/ whatsapp, making business calls, making self-recorded informative videos, inquiring about a concept/activity, describing a concept/activity. Reading - reading the headlines on news magazines - slogans and taglines from advertisements. Writing - free writing - writing - headlines, slogans and taglines individual inspirations. Grammar- conjunctions, idioms, phrases, quotes. Vocabulary development - guessing the meanings of words in different contexts.

**UNIT III**

9

Listening - courtroom scenes from movies, debates and talks from news channels, notes taking. Speaking - language and tone for arguments, discussion, deliberation, contemplation, expressing opinions, reacting to different situations in an alien country. Reading - language used in instruction manuals of household appliances, cookery and other basic instructions. Writing- understanding the structure of texts - use of reference words, discourse markers- coherence, rearranging the jumbled sentences. Grammar - adjectives - degrees of comparison, framing direct and indirect questions. Vocabulary development - concise approach, single word substitution.

**UNIT IV****9**

Listening - Sports commentaries, advertisements with users' criticisms; Speaking - for social causes, for promoting a concept, negotiating and bargaining; Reading - review of a product, movie, movement or a system; Writing - writing for advertisements, selling a product; Grammar – Tenses - Simple Past, Present and Future, Continuous - Past, Present and Future; Vocabulary Development - synonyms, antonyms and phrasal verbs.

**UNIT V****9**

Listening - video lectures, video demonstration of a concept; Speaking – presenting papers/concepts, delivering short speeches, discourses on health, suggesting natural home remedies, cleanliness, civic sense and responsibilities; Reading - columns and articles on home science; Writing - correspondences of requests, basic enquiry/observation and basic complaints; Grammar - modal verbs, perfect tenses - Vocabulary development - collocations.

**TOTAL : 45 PERIODS****OUTCOMES:**

<b>CO</b>	<b>CO statements</b> <b>Upon successful completion of the course, the students should be able to</b>	<b>RBT Level</b>
<b>CO1</b>	Acquire adequate vocabulary for effective communication	<b>3</b>
<b>CO2</b>	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and newspapers.	<b>3</b>
<b>CO3</b>	Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.	<b>4</b>
<b>CO4</b>	Comprehend conversations and short talks delivered in English.	<b>6</b>
<b>CO5</b>	Write short write-ups and personal letters and emails in English	<b>6</b>

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**REFERENCES:**

1. Department of English, Anna University. "Mindscapes: English for Technologists and Engineers", Orient Blackswan, Chennai, 2012.
2. Downes, Colm, "Cambridge English for Job-hunting", Cambridge University Press, New Delhi, 2008.
3. Murphy, Raymond, "Intermediate English Grammar with Answers", Cambridge University Press, 2000.
4. Thomson, A.J., "Practical English Grammar 1 & 2", Oxford, 1986.

**Web Link:**

1. <http://www.usingenglish.com>
2. <http://www.uefap.com3>
3. <https://owl.english.purdue.edu/owl/>
4. [www.learnenglishfeelgood.com/esl-printables-worksheets.html](http://www.learnenglishfeelgood.com/esl-printables-worksheets.html)

**Software**

1. Face2Face Advance - Cambridge University Press, 2014
2. English Advance Vocabulary - Cambridge University Press
3. IELTS test preparation - Cambridge University Press 2017
4. Official Guide to the TOEFL Test With CD-ROM, 4<sup>th</sup> Edition
5. CAMBRIDGE Preparation for the TOEFL TEST - Cambridge University Press, 2017

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
5	-	-	-	-	-	-	-	-	-	3	-	-	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

MA22151

**APPLIED MATHEMATICS – I**

(Common to all Branches except MR)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**OBJECTIVES**

- Compute eigen values and eigen vectors and use in diagonalization and in classifying real quadratic forms.
- Study differential calculus and its applications to relevant Engineering problems.
- Compute derivatives using the chain rule or total differentials.
- Understand the rotation of two dimensional geometry using definite integrals.
- Acquaint with the Mathematical tools needed in evaluating multiple integrals and their usage.

**UNIT I      MATRICES**

**12**

Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Statement and Applications of Cayley-Hamilton Theorem –Diagonalization of matrices– Reduction of a quadratic form into canonical form by orthogonal transformation-Nature of quadratic forms.

**UNIT II      APPLICATION OF DIFFERENTIAL CALCULUS**

**12**

Curvature and radius of Curvature– Centre curvature – Circle of curvature –Evolutes– Envelopes- Evolute as Envelope of Normals.

**UNIT III      DIFFERENTIAL CALCULUS FOR SEVERAL VARIABLES**

**12**

Limits and Continuity - Partial derivatives – Total derivatives – Differentiation of implicit functions – Jacobians and properties– Taylor’s series for functions of two variables – Maxima and Minima of functions of two variables –Lagrange’s method of undetermined multipliers.

**UNIT IV      APPLICATION OF DEFINITE INTEGRALS**

**12**

Integration by Parts-Bernoulli’s formula for integration- Definite integrals and its Properties- Solids of Revolution- Disk Method- Washer Method- Rotation about both x and y axis and Shell method.

**UNIT V      MULTIPLE INTEGRALS**

**12**

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves - Change of variables in double integrals – Triple integrals – Volume of solids.

**TOTAL : 60 PERIODS**

## OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Solve the Eigen value problems in matrices.	2
CO2	Apply the basic notion of calculus in Engineering problems and to tackle for different geometries	2
CO3	Perform calculus for more than one variable and its applications in Engineering problems.	2
CO4	Apply definite integrals for design of three dimensional components	2
CO5	Evaluate multiple integral in Cartesian and polar coordinates.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

## TEXT BOOKS

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, “Advanced Engineering Mathematics”, 10th Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S “Higher Engineering Mathematics”, 43<sup>rd</sup> Edition, Khanna Publications, Delhi, (2015).

## REFERENCES

1. Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, 9<sup>th</sup> edition, Laxmi Publications Pvt. Ltd., 2014.
2. Glyn James, “Advanced Modern Engineering Mathematics”, 4<sup>th</sup> Edition, Pearson Education,(2016).
3. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2013).

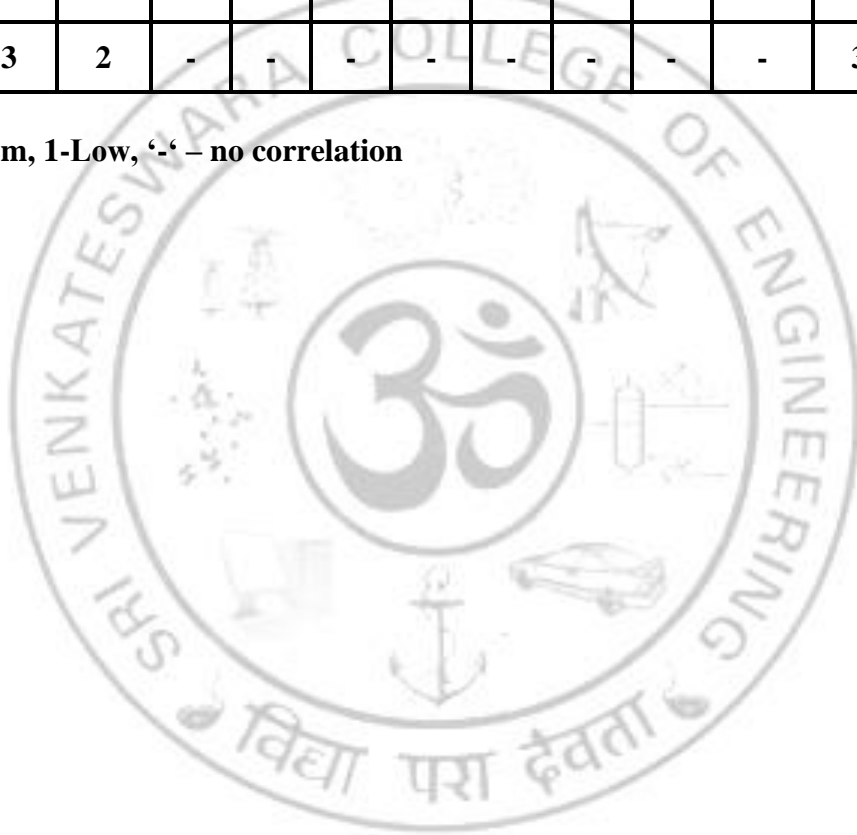
## Web Link:

1. <https://home.iitk.ac.in/~peeyush/102A/Lecture-notes.pdf>
2. <https://www.sydney.edu.au/content/dam/students/documents/mathematics-learning-entre/integration-definite-integral.pdf>

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	-	-	-	-	-	-	-	-	3	2	-
2	3	3	2	-	-	-	-	-	-	-	-	3	-	-
3	3	3	2	-	-	-	-	-	-	-	-	3	-	1
4	3	3	2	-	-	-	-	-	-	-	-	3	-	-
5	3	3	2	-	-	-	-	-	-	-	-	3	-	1

3-High, 2-Medium, 1-Low, '-' – no correlation





**PH22151**

**APPLIED PHYSICS**

(Common to AD, CS, EE, EC, IT)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES**

- To enhance the fundamental knowledge in Physics and its applications relevant to various Streams of Engineering and Technology

**UNIT I LASERS AND FIBER OPTICS 9**

Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Nd-YAG laser – CO<sub>2</sub> Laser – Exceimer Laser – Applications. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers–Fiber optic communication - fibre optic sensors: pressure and displacement - Endoscope.

**UNIT II QUANTUM PHYSICS 9**

Black body radiation – Planck's theory (derivation)- deduction of Wien's and Rayleigh Jean's law – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent wave equations – particle in a one-dimensional - three dimensional potential box–Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals

**UNIT III CRYSTAL PHYSICS 9**

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – interplanar distances- coordination number and packing factor for SC, BCC, FCC, HCP and Diamond structure (qualitative) - crystal imperfections: point defects, line defects – Burger vectors, stacking faults

**UNIT IV WAVES AND OSCILLATIONS 9**

Travelling waves, Wave equation for string ,Energy and momentum , Resonance Superposition & Reflection, Standing waves, Harmonic oscillations, Damped harmonic motion- Forced oscillations, amplitude resonance - Expression for Resonant frequency, Electrical analogy of mechanical oscillations, Quality factor and sharpness of resonance, Electrical analogy of mechanical oscillators

**UNIT V ELECTROMAGNETIC WAVES 9**

Maxwell's Equations. Vector and Scalar Potentials. Plane waves in Dielectric media. Poynting Theorem and Poynting Vector.- Electromagnetic (EM) Energy Density. Physical Concept of Electromagnetic Field Energy Density, EM Wave Propagation in Unbounded Media, Plane EM waves

through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

<b>CO</b>	<b>CO statements</b> <b>Upon successful completion of the course, the students should be able to</b>	<b>RBT Level</b>
<b>CO1</b>	Develop an understanding about photonics and Fiber Optic communication system	<b>2</b>
<b>CO2</b>	Acquire the knowledge of Quantum mechanics	<b>3</b>
<b>CO3</b>	Classify and demonstrate the fundamentals of crystals and their defects.	<b>3</b>
<b>CO4</b>	Gain knowledge in waves and oscillations	<b>2</b>
<b>CO5</b>	Enable to explore the theory of electromagnetic waves and its propagation	<b>3</b>

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**TEXT BOOKS:**

1. Gaur R.K., Gupta S.L, "Engineering Physics", Dhanput Publications, 2015.
2. Shatendra Sharma, Jyotsna Sharma, "Engineering Physics", Pearson, 2006.
3. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
4. Arumugam M, "Materials Science", Anuradha Publications, 2015.

**REFERENCES:**

1. David Halliday, Robert Resnick, Jearl Walker, "Principles of Physics", 10th Edition, Wiley,2015.
2. Peter Atkins, Julio De Paula, "Physical Chemistry",10th Edition., Oxford University Press,2014.
3. Arthur Beiser, Shobhit Mahajan, Rai Choudhury S,"Concepts of Modern Physics", 7<sup>th</sup> Edition, McGraw Hill Education, 2017.
4. Raghavan V, "Materials Science and Engineering", PHI Learning Pvt. Ltd., 2010

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	-	-	2	2	-	-	-	1	-	-	1	-
2	3	3	2	2	2	2	-	-	-	1	-	2	-	1
3	3	-	-	-	-	-	-	-	-	1	-	-	1	-
4	3	-	2	-	-	-	-	-	-	1	-	-	-	-
5	3	3	2	2	2	-	-	-	-	1	-	2	-	2

3-High, 2-Medium, 1-Low, '-' – no correlation



CY22151

**APPLIED CHEMISTRY**

(Common to AD, CS, EE, EC, IT)

L	T	P	C
3	0	0	3

**OBJECTIVES**

- To make the students conversant with basics of electrochemistry and batteries.
- To develop an understanding of the laws of photochemistry and its basics.
- To acquaint the students with the basics of nanomaterials, their properties and uses.
- To acquire the basic knowledge on sensors which are essential for the software engineers for develop new devices.
- To enable the students to understand the types of instruments for material analysis and their working principle.

**UNIT I ELECTROCHEMISTRY**

**9**

Electrodes and electrochemical cells – electrode potential, standard electrode potential, single electrode potential and its determination, types of electrodes – calomel, quinhydrone and glass electrode. Nernst equation - Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries – Primary (dry cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery) and next generation batteries.

**UNIT II PHOTOCHEMISTRY**

**9**

Black body radiation – Planck's theory (derivation)- deduction of Wien's and Rayleigh Jean's law – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent wave equations – particle in a one-dimensional - three dimensional potential box–Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals

**UNIT III NANOCHEMISTRY**

**9**

Basics and scale of nanotechnology, different classes of nanomaterials, Distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Synthesis of nanomaterials, fabrication (lithography) and its applications – Basics of nanophotonics and quantum confined materials (surface plasmon resonance).

**UNIT IV CHEMICAL SENSOR**

**9**

Sensors, sensor science and technology, types of sensors. Chemical Sensors – characteristics and elements. Electrochemical sensors – voltammetry, potentiometric sensors, amperometric sensors, polarization techniques.

**UNIT V INSTRUMENTATION TECHNIQUES****9**

Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental method - Electromagnetic radiation-UV-visible and IR spectroscopy: principles, instrumentation (Block diagram only) and applications. Separation techniques chromatography: Gas chromatography, liquid chromatography -importance of column technology (packing, capillaries), separation based on increasing number of factor (volatility, solubility, interactions with stationary phase, size)

**TOTAL : 45 PERIODS****OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Describe the electrolytic and electrochemical cell, various fundamental aspects of electrochemistry and batteries	2
CO2	Interpret the photochemical reactions and their applications	2
CO3	Differentiate the nano and bulk materials, their synthesis and its applications in various fields.	3
CO4	Acquire the basic knowledge on chemical sensors to develop an interdisciplinary approach among the students which are essential for the software engineers	1
CO5	Develop theoretical principles of UV-visible and IR spectroscopy and separation techniques	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**TEXT BOOKS:**

1. Jain P.C. and Monica Jain, "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd., New Delhi, 2010.
2. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
3. B.K.Sharma, "Instrumental Methods of Chemical Analysis", 28th Edition, Goel Publishing House, 2012.
4. Skoog, D.A. Holler F.J. Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India.

**REFERNCES:**

1. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
2. B.R. Puri, L.R. Sharma, M.S. Pathania., "Principles of Physical Chemistry" Vishal Publishing Company, 2008.

3. John Vetelino, AravindReghu, Introduction to Sensors , Taylor & Francis Group, CRC Press, 1st edition, 2010.
4. Peter Gründler, Chemical Sensors, An Introduction for Scientists and Engineers, Springer-Verlag Berlin Heidelberg 2007.

### COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	-	-	-	-	-	-	-	3	1	1
2	3	3	-	-	-	3	3	-	-	-	-	3	-	-
3	3	3	3	-	-	3	3	1	-	-	-	3	-	1
4	3	3	3	-	1	3	3	-	-	-	-	3	-	1
5	3	3	-	2	-	3	3	-	-	-	-	3	1	-

3-High, 2-Medium, 1-Low, '-' – no correlation

EE22151

**BASIC ELECTRICAL AND ELECTRONICS  
ENGINEERING**

(Common to all Branches except CH, EE, EC)

L	T	P	C
3	0	0	3

**OBJECTIVES**

- To understand the basic theorems used in Electrical circuits.
- To educate on the different concepts and functions of electrical machines.
- To introduce electron devices and its applications.
- To explain the principles of digital electronics.
- To impart knowledge on the principles of measuring instruments.

**UNIT I ELECTRICAL CIRCUITS 9**

Ohm's Law – Kirchhoff's Laws - Steady State Solution of DC Circuits using Mesh and Nodal Analysis -Introduction to AC Circuits - Waveforms and RMS Value - Power and Power factor - Single Phase and Three Phase AC Balanced Circuits.

**UNIT II ELECTRICAL MACHINES 9**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single phase induction Motor, Single Phase Transformer.

**UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 9**

Characteristics of PN Junction Diode - Zener Effect - Zener Diode - LED, Photo diode and its Characteristics-Half Wave and Full Wave Rectifiers-Voltage Regulation. Bipolar Junction Transistor-Common Emitter Configuration, Characteristics and CE as an Amplifier - Photo transistors

**UNIT IV DIGITAL ELECTRONICS 9**

Number System Conversion Methods–Simplification of Boolean Expression using K-Map – Half and Full Adders – Flip-Flops – Shift Registers - SISO, SIPO, PISO, PIPO and 4-bit Synchronous and Asynchronous UP Counters.

**UNIT V MEASURING INSTRUMENTS 9**

Types of Signals: Analog and Digital Signals- Construction and working Principle of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters. Instrumentation Amplifier, – R-2R ladder Type D/A Converter - Flash Type and Successive Approximation Type A/D Converter.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
C01	Compute the electric circuit parameters for simple problems	2
C02	Understand the construction and characteristics of different electrical machines.	1
C03	Describe the fundamental behavior of different semiconductor devices and circuits.	2
C04	Design basic digital circuits using Logic Gates and Flip-Flops.	3
C05	Analyze the operating principle and working of measuring instruments.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**TEXT BOOKS:**

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. SedhaR.S., "A Text Book of Applied Electronics", S.Chand&Co., 2014.

**REFERCENCES:**

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics Engineering", Tata McGraw Hill, 2013.
2. MehtaVK, "Principles of Electronics", S. Chand &CompanyLtd, 2010.
3. M. Morris Mano, "Digital Logic & Computer Engineering", Prentice Hall of India, 2004.
4. Mahmood Nahvi and Joseph A.Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, Fourth Edition, 2007.



## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	2	-	-	-	-	2	-	-
2	3	3	3	3	-	-	2	-	-	-	-	2	-	-
3	3	3	3	3	-	-	2	-	-	-	-	2	-	-
4	3	3	3	3	-	-	2	-	-	-	-	2	-	-
5	3	3	3	3	-	-	2	-	-	-	-	2	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation



**IT22101**

**PROGRAMMING FOR PROBLEM SOLVING**

(Common to IT, AD, CS, EE, EC)

L	T	P	C
3	0	0	3

**OBJECTIVES**

- Learn the organization of a digital computer.
- Learn to think logically and write algorithms or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

**UNIT I INTRODUCTION TO PROBLEM SOLVING**

**9**

Simple model of a Computer – Hardware – Software – Data Representation, Introduction to Computer Networks and Internet, Problem Solving Techniques – Bottom up design and top down design - applications, Introduction to Algorithms and Flow Chart  
Suggested Activities: Case study – Understanding the analysis and design of the Student Management System (SMS).

**UNIT II C PROGRAMMING BASICS**

**9**

Introduction to ‘C’ programming – structure of a ‘C’ program – Conversion of simple algorithm to program. Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

Suggested Activities: Case study: Dataset creation and Grade calculation in SMS

**UNIT III ARRAYS AND STRINGS**

**9**

Array: declaration, initialization. Multi dimensional arrays. Strings: Strings vs Character arrays, string operations

Suggested Activities - Grade sheet generation in SMS

**UNIT IV FUNCTIONS AND STRUCTURES**

**9**

Need for Modular programming, Functions: definition, call, arguments, call by value. Call by reference, Recursion. structures and unions: Need, declaration, Accessing Structure elements, Arrays of structures

Suggested Activities: Redesigning SMS in terms of modules

**UNIT V POINTERS AND FILE HANDLING IN C**

**9**

Pointers : Introduction, pointers to primitive datatypes, pointers to user defined datatypes: arrays and structures, array of pointers, Dynamic Memory Allocation. Files: Read/Write of binary and text files.

Preprocessor directives

Suggested Activities: Manage I/O in SMS using Files

**TOTAL : 45 PERIODS**

**OUTCOMES:**

<b>CO</b>	<b>CO statements</b> <b>Upon successful completion of the course, the students should be able to</b>	<b>RBT Level</b>
<b>CO1</b>	Identify input and output from the real word problem scenarios	<b>3</b>
<b>CO2</b>	Represent the design flow using Flow-charts and application logic using pseudo code	<b>3</b>
<b>CO3</b>	Apply appropriate programming constructs to implement a given design using C.	<b>3</b>
<b>CO4</b>	Debug and customize an existing software developed in C	<b>5</b>
<b>CO5</b>	Develop a modularized software application In C for the given user requirements	<b>6</b>

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**TEXT BOOKS:**

1. Pradip Dey, Manas Ghosh, “Programming in C”, First Edition, Oxford University Press, 2018.
2. R G Dromey, “How to Solve it using Computer”, Pearson,2006.

**REFERNCES:**

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.
2. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.
3. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Third Edition, Tata McGrawHill, 2010
4. Reema Thareja, “Programming in C”, 2nd ed., Oxford University Press, 2016

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	3	-	-	-	-	-	-	3	-	-	2	2	-
2	1	3	-	-	-	-	-	-	3	-	-	2	2	1
3	1	-	3	2	1	-	-	-	3	-	-	2	3	-
4	1	-	3	2	1	-	-	-	3	-	-	2	-	3
5	1	-	3	2	1	-	-	-	3	-	-	2	1	3

3-High, 2-Medium, 1-Low, '-' – no correlation



PH22161

**PHYSICS LABORATORY**  
**(COMMON TO ALL BRANCHES EXCEPT BT)**

L	T	P	C
0	0	2	1

**OBJECTIVES**

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

**LIST OF EXPERIMENTS**

1. a) Determination of Wavelength, and particle size using Laser.  
b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of Young's modulus by Non uniform bending method.
6. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
7. Determination of Rigidity modulus of a given wire -Torsional Pendulum
8. Energy band gap of a Semiconductor
9. Determine the Hysteresis loss of a given Specimen
10. Calibration of Voltmeter & Ammeter using potentiometer.

**TOTAL : 45 PERIODS**

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Standalone desktops with C compiler 30 Nos. or Server with C compiler supporting 30 terminals or more

**REFERENCES:**

1. "Physics Laboratory practical manual", 1<sup>st</sup> Revised Edition by Faculty members, 2018.

**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.	4
CO2	Comprehend the Experiments in the areas of optics, mechanics and thermal physics to nurture the concepts in all branches of Engineering.	3
CO3	Apply the basic concepts of Physical Science to think innovatively and also improve the creative skills that are essential for engineering.	3
CO4	Evaluate the process and outcomes of an experiment quantitatively and qualitatively	3
CO5	Extend the scope of an investigation whether or not results come out as expected	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	3	2	-	-	-	3	1	-	2	2	-
2	3	3	-	3	-	2	-	-	3	1	-	2	2	-
3	3	3	2	3	2	2	-	-	3	1	-	2	1	2
4	3	3	-	3	-	-	-	-	3	1	-	2	-	-
5	3	3	-	3	2	-	-	-	3	1	-	2	-	1

3-High, 2-Medium, 1-Low

EE22111

**BASIC ELECTRICAL AND ELECTRONICS  
ENGINEERING LABORATORY  
(COMMON TO ALL BRANCHES EXCEPT EC)**

L	T	P	C
0	0	2	1

**OBJECTIVES**

- To provide exposure to the students with hands on experience in basic of Electrical and Electronics wiring connection and measurements.
- To introduce the students to Electrical Machines and basic laws of Electrical Circuits.

**LIST OF EXPERIMENTS**

1. Wiring – Residential house wiring and Stair case wiring.
2. (a) AC Analysis- Measurement of electrical quantities–voltage, current, power, and power factor using RLC.  
(b) Study of three phase system.
3. Energy conservation - Measurement and comparison of energy for incandescent lamp and LED lamp.
4. (a) Identification of circuit components (Resistor, Capacitor, Diode and BJT) and soldering practice.  
(b) Signal Measurement- Measurement of peak to peak, RMS, average, period, frequency of signals using CRO.
5. (a) VI Characteristics of Solar photovoltaic panel.  
(b) Design of Solar PV Array and Battery sizing for Residential solar PV system.
6. Design a 5V/12V Regulated Power Supply using FWR and IC7805 / IC7812.
7. DC Analysis- Verification of Ohm’s Law and Kirchhoff’s Laws.
8. Study of Transformer and motor characteristics.

**TOTAL : 30 PERIODS**

**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Wiring of basic electrical system and measurement of electrical parameters.	4
CO2	Verify the basic laws of Electric circuits and select various Electrical Machines.	4
CO3	Construct electronic circuits and design solar photovoltaic system.	4
CO4	Apply the concept of three-phase system.	4
CO5	Construct a fixed voltage regulated power supply.	4

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	-	-	2	-	-	2	-	-
2	3	3	3	3	-	-	-	-	2	-	-	2	-	-
3	3	3	3	3	-	-	-	-	2	-	-	2	-	-
4	3	3	3	3	-	-	-	-	2	-	-	2	-	-
5	3	3	3	3	-	-	-	-	2	-	-	2	-	-

3-High, 2-Medium, 1-Low





IT22111

**PROGRAMMING FOR PROBLEM SOLVING  
LABORATORY  
(COMMON TO IT, AD, CS, EE, EC)**

L	T	P	C
0	0	3	1.5

**OBJECTIVES**

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

**LIST OF EXPERIMENTS**

1. Usage of Basic Linux commands
2. C Programming using Simple statements and expressions.
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings
6. C Programming using Pointers
7. C Programming using user defined functions (Pass by value and Pass by reference)
8. C Programming using Recursion
9. C Programming using structures and union
10. C Programming using enumerated data types
11. C Programming using macros and storage classes
12. C Programming using Files
13. Develop modularized application for any one of the following scenarios Scenarios:
  - Student Management System
  - Stock Management System
  - Banking Application
  - Ticket Reservation System

**TOTAL : 45 PERIODS**

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Hardware/Software Requirements (For a batch of 30 students)  
Computer with Windows/Linux OS and C compiler -30 No.s

**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply appropriate programming constructs to solve problems.	3
CO2	Design, implement, test and debug programs that use the basic features of C.	5
CO3	Design modularized applications in C to solve real world problems.	6
CO4	Use C pointers and dynamically allocated memory to solve complex problems	4
CO5	Apply file operations to develop solutions for real-world problems	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	3	-	-	-	-	-	-	3	-	-	2	2	1
2	1	3	-	-	-	-	-	-	3	-	-	2	-	-
3	1	-	3	2	1	-	-	-	3	-	-	2	2	1
4	1	-	3	2	1	-	-	-	3	-	-	2	-	2
5	1	-	3	2	1	-	-	-	3	-	-	2	1	1

3-High, 2-Medium, 1-Low

HS22251

அறிவியல் மற்றும் தொழில்நுட்பத்தில் தமிழ்  
SCIENCE AND TECHNOLOGY IN ANCIENT  
TAMIL SOCIETY

(Common to all Branches)

L	T	P	C
2	0	0	2

பாடத்தின் நோக்கங்கள் :

- அறிவியலில் தமிழின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள்.
- தொழில்நுட்பத்தில் தமிழ் பாரம்பரியத்தின் தாக்கம் பற்றி அறிந்து கொள்வார்கள்.

OBJECTIVES:

- They will know about the use of Tamil in science.
- Learn about the impact of Tamil heritage on technology.

அலகு 1 அறிவியல் தமிழ்

6

கருவி உருவாக்கம் - ஆராய்ச்சி மேம்பாடு - கல்வி வளர்ச்சி - அறிவியல் தமிழ் சொற்கள் உருவாக்கம்.

UNIT I SCIENTIFIC TAMIL

Tool Development - Research Development - Educational Development - Scientific Tamil words Creation.

அலகு 2 தொழில்நுட்பத்தில் தமிழ்

24

வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம் : சங்க காலத்தில் கட்டுமானப் பொருட்கள் - சோழர்களின் பெரியகோவில்கள் மற்றும் பிற வழிபாட்டுதலங்கள் - பல்லவர்களின் சிற்பங்கள் மற்றும் கோவில்கள் (மாமல்லபுரம்) - நாயக்கன் கால கோவில்கள் (மதுரை மீனாட்சி அம்மன் கோவில்), திருமலை நாயக்கர் மஹால், செட்டிநாட்டு வீடுகள்.

உற்பத்தி தொழில் நுட்பம் : கப்பல் கட்டும் கலை, உலோகவியல் ஆய்வுகள், தங்கம், தாமிரம், இரும்பு பற்றிய அறிவு - தொல்பொருள் சான்றுகள் - சுட்டக் களிமண் மணிகள், சங்கு மணிகள், எலும்பு மணிகள்.

விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பம் : அணைகள், ஏரிகள், குளங்கள், மதகுகள், சோழர் கால குழுவி தூம்பு ஆகியவற்றின் முக்கியத்துவம் - கால்நடை பராமரிப்பு, கால்நடைகளின் பயன்பாட்டிற்காக வடிவமைக்கப்பட்ட கிணறுகள். விவசாயம் மற்றும் வேளாண் செயலாக்கம் - கடல் பற்றிய அறிவு - மீன் பிடித்தல், முத்து குளித்தல், சங்கு சேகரித்தல்.

தமிழ் கணினி: அறிவியல் தமிழ் வளர்ச்சி - தமிழ் கணினி, தமிழ் புத்தகங்களின் டிஜிட்டல்மயமாக்கல், தமிழ் டிஜிட்டல் நூலகம், தமிழ் மென்பொருள் உருவாக்கம் - தமிழ் மெய் நிகர் அகாடமி - சொற்குவை திட்டம்.

தமிழின் எதிர்காலமும் தகவல் தொழில்நுட்பமும்- உலகமயமாக்கலும் தகவல் தொழில்நுட்பமும் - கணினிக்கு தமிழ் கற்று கொடுத்தல் - தமிழ்மொழித் தொழில்நுட்பத்தில் வளங்கள்.

## UNIT II TAMIL IN TECHNOLOGY

**Design and Construction Technology :** Building materials in Sangam age – Great temples of Cholas and other workshop places – Sculptures and Temples of Pallavas (Mamallapuram) – Temples of Nayakas period (Madurai Meenakshi amman temple), Thirumalai Nayakar Mahal, Chetti Nadu Houses.

**Manufacturing Technology :** Art of Ship building, Metallurgical studies, Knowledge about Gold, Copper, Iron – Archeological evidences – Terracotta beads, Shell beads, Bone beads.

**Agriculture and Irrigation Technology:** Dams, Tank, ponds, sluice, Significance of Kumuzhi Thoompu of Cholas period- Animal Husbandry, Wells designed for cattle use. Agriculture and Agro processing, - Knowledge about Sea – Fisheries, Pearl, Conche diving.

**Tamil Computing :** Development of Scientific Tamil – Tamil Computing, Digitization of Tamil books, Tamil Digital Library, Development of Tamil Softwares – Tamil virtual Academy – Sorkuvai project. Future of Tamil and Information Technology- Globalization and Information Technology- Teaching Tamil for Computer-Resources in Tamil Language Technology.

**TOTAL : 30 PERIODS**

பாடநெறி முடிவுகள் :  
**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	அறிவியலில் தமிழ் மொழியின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள் They will know about the use of Tamil language in science	2
CO2	பல்வேறு தொழில்நுட்பத்தில் தமிழ்மொழியின் தாக்கம் பற்றி அறிந்து கொள்வார்கள் They will learn about the influence of Tamil language in various technologies	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

பாடநூல்கள்:  
**REFERNCES:**

1. டாக்டர், வா.செ .குழந்தைசாமி (1985), "அறிவியல் தமிழ்" , பாரதி பதிப்பகம், 126/108, உஸ்மான் சாலை, தியாகராய நகர் , சென்னை 600017.
2. சுப. திண்ணப்பன், (1995), "கணினியும் தமிழ் கற்பித்தலும்", புலமை வெளியீடு, 38-B மண்ணத்தநோட்டத் தெரு, ஆழ்வார்பேட்டை, சென்னை 600018.
3. மு. பொன்னவைக்கோ, (2003), "வளர்தமிழில் அறிவியல் – இணையத் தமிழ்", அனைத்திந்திய அறிவியல் தமிழ்க் கழகம், தஞ்சாவூர் 615 005.
4. துரை. மணிகண்டன், (2008), "இணையமும் தமிழும்", நல்நிலம் பதிப்பகம், 7-3, சிமேட்லி சாலை, தியாகராய நகர், சென்னை 600 017.

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	3	2	3	3	2	2	3	3	-	2	-	-
2	-	-	3	2	3	3	2	-	3	3	-	2	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation



HS22252

## TECHNICAL ENGLISH

(Common to all Branches)

L	T	P	C
2	1	0	3

### OBJECTIVES

- To enable learners to define and understand technical communication and scientific writing.
- To expose learners to nuances of seminar presentation, group discussion, and public speaking.
- To expose learners to writing for scientific purposes.
- To expose learners to drafting correspondences for business purposes.
- To expose learners to writing for documenting purposes.
- To enable students to have a holistic understanding of job interviews and recruiting process.

### UNIT I

9

**Listening** - AV files pertaining to manufacturing processes of products, scientific documentaries; **Speaking** - syllable division and word stress, intonation, sharing opinions; **Reading** - news articles related to science and technology; **Writing** - definitions, instruction, recommendation, data interpretation, resume; **Grammar** - tenses and their aspects, sentence connectors - discourse markers, sequential words, active and passive voice, subject-verb agreement.

### UNIT II

9

**Listening** - AV pertaining to marketing strategies, peer reading and pronunciation; **Speaking** - turn taking, sharing opinions; conducting and attending a meeting, understanding the nuances of spoken communication among internal audience and external audience; **Reading** - analytical documents, descriptive documents; **Writing** - fliers, brochures, resume - letter of application, checklists; **Grammar** - modal verbs, clauses - types and uses, conditional clauses, articles.

### UNIT III

9

**Listening** - AV related to how to use components, scientific description, **Speaking** - speaking for motivation and initiation, speaking at a seminar presentation; **Reading** - scientific journals, papers; **Writing** - Technical descriptions - process description, purpose and function, PowerPoint, Google forms, user manuals; **Grammar** - phrasal verbs, prepositions, technical and scientific affixes.

### UNIT IV

9

**Listening** - scientific debates, crisis management; **Speaking** - handling conflicts, speaking about the loss of benefits, progress or decline of business, identifying the connotative meanings, **Reading** - documented evidences of uses and functions of a product, review of a product, **Writing** - memos, follow-up letters, reports - proposal, project, progress reports, sales reports, reports on industrial visits, executive summary. **Grammar** - reported speech and tag questions, sentence structure - comparative, imperative, cause and effect, infinitive of result.

## UNIT V

9

**Listening** - AV of Group discussions, panel discussions, face to face interviews for recruitment purposes; **Speaking**- speaking at group discussions, interviewing a personality, answering at the interviews; **Reading** - WebPages of topnotch engineering companies, **Writing** - blogging, e-mails, letter of complaint, minutes of the meeting; **Grammar** - one word substitution, collocations, better word/sentence substitution (rephrasing the content/improvising ideas).

**TOTAL : 45 PERIODS**

**Suggested Activities [task based]** - case study, guest lectures as models, problem solving, understanding teamwork.

### OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Understand the nuances of technical communication and scientific writing	3
CO2	Present papers and give seminars	6
CO3	Discuss in groups and brainstorm	6
CO4	Draft business correspondences and write for documenting purposes	6
CO5	Face job interviews with confidence	6

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

### REFERENCES

1. Department of English, Anna University. "Mindscapes: English for Technologists and Engineers", Orient Blackswan, Chennai, 2012.
2. Downes, Colm, "Cambridge English for Job-hunting", Cambridge University Press, New Delhi, 2008.
3. Murphy, Raymond, "Intermediate English Grammar with Answers", Cambridge University Press, 2000.
4. Thomson, A.J., "Practical English Grammar 1 & 2", Oxford, 1986.
5. Herbert A J, "The Structure of Technical English", Longman, 1965.

**Web Link:**

1. <http://www.usingenglish.com>
2. <http://www.uefap.com3>
3. <https://owl.english.purdue.edu/owl/>
4. [www.learnenglishfeelgood.com/esl-printables-worksheets.html](http://www.learnenglishfeelgood.com/esl-printables-worksheets.html)

**Software**

1. Face2Face Advance - Cambridge University Press, 2014
2. English Advance Vocabulary - Cambridge University Press
3. IELTS test preparation - Cambridge University Press 2017
4. Official Guide to the TOEFL Test With CD-ROM, 4<sup>th</sup> Edition
5. CAMBRIDGE Preparation for the TOEFL TEST - Cambridge University Press, 2017

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
5	-	-	-	-	-	-	-	-	-	3	-	-	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation



MA22251

**APPLIED MATHEMATICS – II**

(Common to all Branches except MR)

L	T	P	C
3	1	0	4

**OBJECTIVES**

- Acquire the concepts of vector calculus needed for problems in all engineering disciplines and compute different types of integrals using Green's, Stokes' and Divergence theorems.
- Skilled at the techniques of solving ordinary differential equations that model engineering problems.
- Extend their ability of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- Explain geometry of a complex plane and state properties of analytic functions.
- Understand the standard techniques of complex variable theory so as to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.

**UNIT I VECTOR CALCULUS**

**12**

Gradient, divergence and curl - Directional derivative - Vector identities – Irrotational and solenoidal vector fields - Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Verification and application in evaluating line, surface and volume integrals.

**UNIT II ORDINARY DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS**

**12**

Differential equations of first order – Equations of the first order and first degree – Linear equations – Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients – Applications of Linear differential equations – Oscillatory electrical circuit – Deflection of beams.

**UNIT III LAPLACE TRANSFORM**

**12**

Conditions for existence - Transform of elementary functions - Transforms of unit step function and impulse functions – Basic properties – Shifting theorems - Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Initial and final value theorems - Transform of periodic functions. Inverse Laplace transforms - Convolution theorem – Application to solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**UNIT IV ANALYTIC FUNCTIONS**

**12**

Analytic functions - Necessary and sufficient conditions (Cauchy-Riemann equations) - Properties of analytic function - Harmonic conjugates - Construction of analytic functions - Conformal mapping – Mapping by functions  $W = Z + C$ ,  $CZ$ ,  $1/Z$ ,  $Z^2$  – Joukowski's transformation- Bilinear transformation.

## UNIT V COMPLEX INTEGRATION

12

Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansions - Singular points - Residues - Cauchy's Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semi-circular contour.

**TOTAL : 60 PERIODS**

### OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Interpret the fundamentals of vector calculus and execute evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems.	3
CO2	Solve first order linear, homogeneous differential equations and use series solution method to solve second order differential equations.	3
CO3	Determine the methods to solve differential equations using Laplace transforms and Inverse Laplace transforms.	3
CO4	Explain Analytic functions and Categorize transformations.	3
CO5	Perform Complex integration to evaluate real definite integrals using Cauchy integral theorem and Cauchy's residue theorem.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

### TEXT BOOKS

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10th Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics", 43<sup>rd</sup> Edition, Khanna Publications, Delhi, (2015).

### REFERENCES

1. Dass, H.K., and Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., 2011.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).
3. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9<sup>th</sup> edition, Laxmi Publications(p) Ltd., 2014.

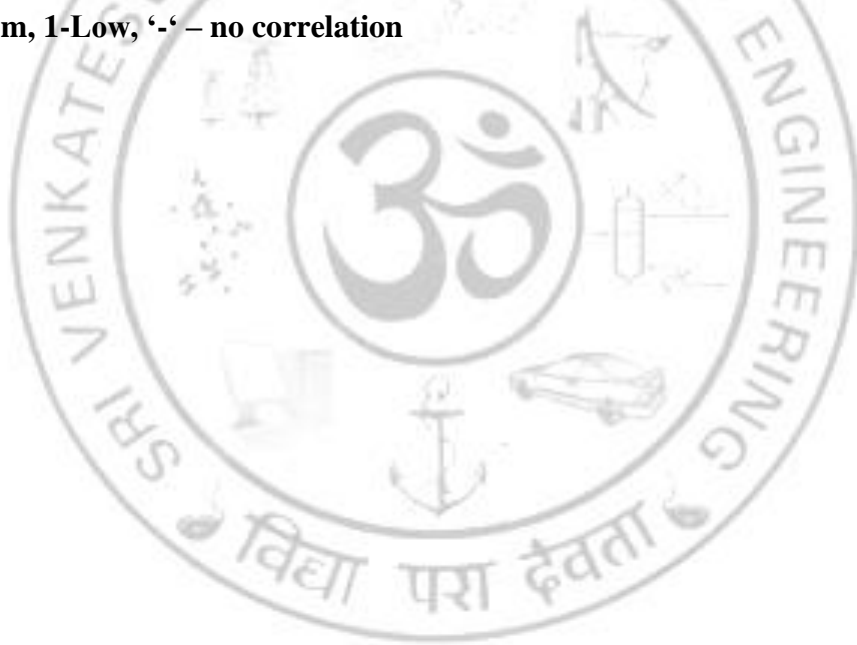
### Web Link:

1. <https://nptel.ac.in/courses/111/105/111105134/>
2. <https://nptel.ac.in/courses/111/105/111105121/>

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	-	-	-	-	-	-	-	-	-	3	-	-
2	3	3	2	-	-	-	-	-	-	-	-	3	-	-
3	3	3	2	-	-	-	-	-	-	-	-	3	-	-
4	3	3	-	-	-	-	-	-	-	-	-	3	-	-
5	3	3	-	-	-	-	-	-	-	-	-	3	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation



ME22251

## TECHNICAL DRAWING

(Common to AD, CS & IT)

L	T	P	C
1	0	2	2

### OBJECTIVES

- This course will introduce the students to build their ability to read drawings and interpret the position and form of simple geometries.

### UNIT 0 CONCEPTS AND CONVENTIONS AND GEOMETRIC CONSTRUCTION (NOT FOR EXAM) 2

Importance of drawing in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning. Geometric construction - to draw perpendiculars, parallel lines, divide a line and circle, to draw equilateral triangle, square, regular polygons.

### UNIT I CONICS, CYCLOID, AND INVOLUTES 7

Geometric construction - Curves used in engineering practices: Conics - Construction of parabola and hyperbola by eccentricity method - Construction of ellipse by Concentric circle method - Drawing of tangents and normal to the above curves - Construction of cycloid in a straight line only - Drawing of tangents and normal to the above curve. Construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above involutes.

### UNIT II PROJECTION OF LINES AND PLANE SURFACES 9

Orthographic projection – First angle projection - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method.

Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes and perpendicular to other by rotating object method.

### UNIT III PROJECTION OF SOLIDS 9

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

### UNIT IV DEVELOPMENT OF SURFACES 9

Development of Surfaces – Development of lateral surfaces of simple solids - Parallel line Development – Prisms, Cylinder - Radial line development – Pyramids and Cone.

### UNIT V ORTHOGRAPHIC AND ISOMETRIC PROJECTION 9

Isometric view of simple solids -Free Hand Drawing - Orthographic Projection - Orthographic views of simple blocks from their Isometric view

TOTAL : 45 (15 L+30P) PERIODS

**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	<i>Construct</i> conic sections, cycloid and involutes as per drawing standards.	3
CO2	<i>Draw</i> orthographic projections of lines and plane surfaces.	2
CO3	<i>Sketch</i> orthographic projections of simple solids.	2
CO4	<i>Develop</i> the lateral surfaces of simple solids.	2
CO5	<i>Sketch</i> the orthographic projections of a given isometric view using free hand.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**TEXT BOOKS**

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.
2. Dhananjay M. Kulkarni, A.P. Rastogi, Ashoke K. Sarkar, “Engineering Graphics with AutoCAD”, PHI Learning Private Ltd., 2009.
3. Venugopal K. and Prabhu Raja V., “Engineering Drawing + AutoCAD”, New Age International (P) Limited, 6<sup>th</sup> edition, 2022

**REFERENCES**

1. Dhananjay A Jolhe, “Engineering Drawing with an Introduction to AutoCAD”, Tata McGraw-Hill Publishing Company Limited., 2008
2. Parthasarathy N. S. and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson Education India, 2nd Edition, 2009.
4. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.

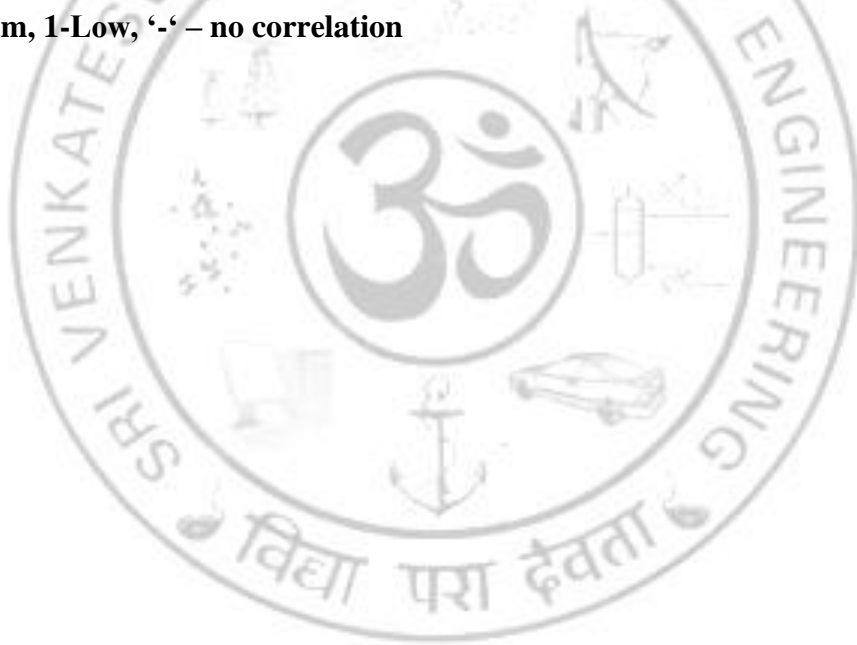
**Web Link:**

1. <https://nptel.ac.in/courses/112105294>
2. <https://nptel.ac.in/courses/112103019>

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	-	1	-	-	-	-
2	-	-	-	-	-	-	-	-	-	2	-	-	-	-
3	-	-	-	-	-	-	-	-	-	2	-	-	-	-
4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
5	-	-	-	-	-	-	-	-	-	3	-	-	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation



MA22253

MATHEMATICS FOR DATA SCIENCE

L	T	P	C
3	1	0	4

## OBJECTIVES

The Student should be made to:

- Learn the basic concepts of Relations and Functions
- Extend the logical and mathematical maturity and ability to deal with abstraction
- Learn the applications of algebraic structures.
- Apply the concepts of Rings, Fields and Polynomials.
- Understand the concepts and significance of lattices and Boolean algebra which are widely used in data science.

### UNIT I SETS RELATIONS AND FUNCTIONS 9+3

Basic concepts of Set theory – Inclusion and Equality of sets – Power sets-St operations – Binary Relation, Partial Ordering Relation, Equivalence Relation – Sum and Product of functions – Bijective functions – Inverse and composite functions.

### UNIT II LOGICS AND PROOFS 9+3

Propositional Logic – Propositional equivalences – Normal forms – Principal Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Inference Theory-Predicates and Quantifiers – Nested Quantifiers – Introduction to proofs – Proof methods and strategy.

### UNIT III ALGEBRAIC STRUCTURES 9+3

Algebraic systems – Semi groups and Monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem.

### UNIT IV RINGS AND FIELDS 9+3

Rings: Definition - Sub rings - Integral domain - Field - Integer modulo n – Ring homomorphism. Rings - Polynomial rings - Irreducible polynomials over finite fields.

### UNIT V LATTICES AND BOOLEAN ALGEBRA 9+3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

**TOTAL (L:45+T:15):60 PERIODS**

**Activities:** Students shall be exposed to MATLAB programming to solve simple algebraic equations.

## OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Perform operations on various discrete structures such as sets, functions and relations.	3
CO2	Test the logic of a programme, having acquired knowledge of the necessary concepts.	3
CO3	Identify structures on many levels as an application of the concepts and properties of algebraic structures.	3
CO4	Apply the basic notions of groups, rings, fields which will be used to solve related problems.	3
CO5	Execute the simplification of Boolean algebraic expression.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

## TEXT BOOKS

1. Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2018.
2. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Publications. Co. Ltd., New Delhi, Special Indian Edition, 2018.
3. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science", Tata Mc Graw Hill Education (India) Edition 2018.

## REFERENCES

1. Lidl, R. and Pitz, G, "Applied Abstract Algebra", Springer Verlag, New Delhi, 2nd Edition, 2006.
2. Seymour Lipschutz, MarcLipson, "Discrete Mathematics, Schaum's Outlines Series", McGraw-Hill Education, 2016.
3. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics: A Computer Oriented Approach", 4th Edition, Tata McGraw–Hill Education Pvt. Ltd, 2017.

### Web Link:

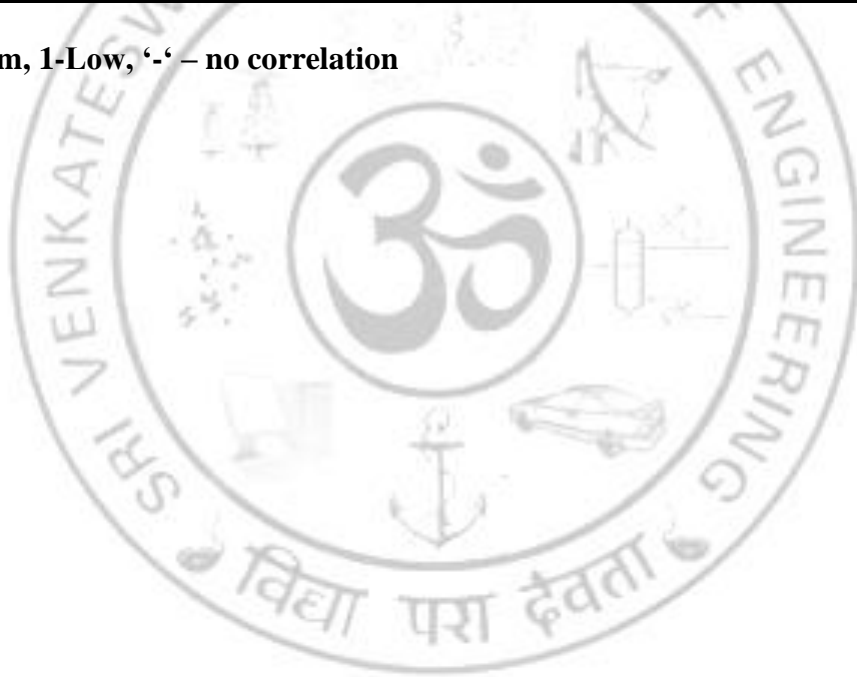
1. <http://home.iitk.ac.in/~aral/book/mth202.pdf>
2. <https://web.stanford.edu/class/cs103x/cs103x-notes.pdf>
3. [https://nios.ac.in/media/documents/SrSec311NEW/311\\_Maths\\_Eng/311\\_Maths\\_Eng\\_Lesson2.pdf](https://nios.ac.in/media/documents/SrSec311NEW/311_Maths_Eng/311_Maths_Eng_Lesson2.pdf)



## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	-	-	-	-	-	3	-	3
2	3	3	3	3	-	-	-	-	-	-	-	3	2	-
3	3	3	2	2	-	-	-	-	-	-	-	3	-	-
4	3	3	2	2	-	-	-	-	-	-	-	3	3	-
5	3	3	2	2	-	-	-	-	-	-	-	3	-	2

3-High, 2-Medium, 1-Low, '-' – no correlation



AD22201

**DATA STRUCTURES AND ALGORITHM  
ANALYSIS**

L	T	P	C
3	0	0	3

**OBJECTIVES**

The students should be able to:

- Learn the algorithm design and analysis techniques with orders of growth
- Understand and implement the linear data structures and its applications
- Understand the tree data structures, priority queues and string matching
- Learn various graph algorithms
- Learn the advanced algorithm design techniques

**UNIT I FOUNDATIONS OF ALGORITHM ANALYSIS**

9

Fundamentals of algorithmic problem solving – Problem types - Growth of Functions - Asymptotic Notations – Brute force approach: Analysis of Non recursive Algorithms - Divide and Conquer: Analysis of recursive algorithms – The backward substitution and the master method for solving recurrences - Sorting: Selection sort - Bubble sort – Insertion Sort - Merge Sort - Quick sort – Radix sort – Bucket sort - Searching: Linear Search – Binary Search.

**UNIT II LINEAR DATA STRUCTURES**

9

List: Array Implementation of List – Linked List – Doubly Linked List – Circular Linked List; Stack: Array and Linked List Implementation – Applications; Queues: Array and Linked List Implementation – Applications; Hashing: Hash Function – Separate Chaining – Open Addressing – Linear Probing

**UNIT III TREES ALGORITHMS**

9

Trees: Binary trees – Binary Search Trees – AVL Trees – Splay Trees – B-Trees - Binary Heap Operations – Heap sort and Priority Queues. String Matching: Naïve String matching algorithm – Rabin-Karp algorithm – Knuth-Morris-Pratt algorithm – Suffix trees.

**UNIT IV GRAPH ALGORITHMS**

9

Representation of Graphs – Breadth First Search – Depth First Search - Topological Sort – Shortest Path Algorithms: Dijkstra's Algorithm - Floyd Warshall's algorithm – Minimum Spanning Tree: Prim's Algorithm – Kruskal's Algorithm

**UNIT V ADVANCED ALGORITHM DESIGN TECHNIQUES**

9

Dynamic Programming: Longest Common Subsequence; Optimal Binary Search trees. Greedy Algorithm: Huffman Codes; Backtracking: n-Queens Problem - Subset-sum Problem; Branch and Bound: Assignment Problem – Knapsack Problem- Introduction to P, NP, NP-complete and NP-Hard problems.

**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Design and analyse time and space complexities of algorithms using different design techniques for various computing problems	2
CO2	Solve problems using suitable linear data structures	3
CO3	Solve problems using suitable nonlinear tree data structures	3
CO4	Demonstrate the use of graph algorithms for solving problems	3
CO5	Design algorithms using advanced algorithm design techniques	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**TEXT BOOKS**

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2013
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012

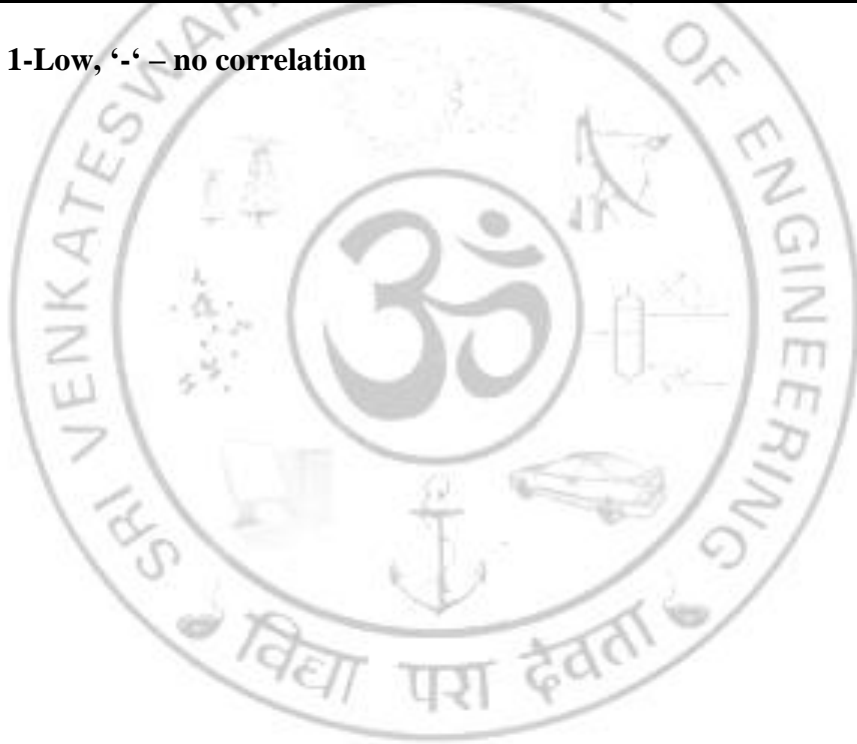
**REFERENCES**

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006
2. Donald E. Knuth, "The Art of Computer Programming", Volumes 1 & 3, Pearson Education, 2009
3. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
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1	-	3	-	-	-	-	-	-	3	-	-	3	3	3
2	-	3	-	-	-	-	-	-	3	-	-	3	3	3
3	-	-	3	3	3	-	-	-	3	-	-	3	3	3
4	3	-	3	3	3	-	-	-	3	-	-	3	3	3
5	3	-	3	3	3	-	-	-	3	-	-	3	3	3

3-High, 2-Medium, 1-Low, '-' – no correlation



AD22202

**OBJECT ORIENTED PARADIGM AND  
PROGRAMMING**

L	T	P	C
3	0	0	3

**OBJECTIVES**

- Familiar with the basic concepts of object oriented programming.
- Familiar with the basic concepts of C++ programming language.
- Familiar with the generic programming, exception and file handling in C++.
- Understand object oriented concepts and basic characteristics of Java.
- Understand the advanced programming concepts in Java.

**UNIT I OBJECT ORIENTED PARADIGM 9**

Object oriented programming concepts – objects – classes – data members and member functions - abstraction and encapsulation – inheritance – polymorphism. Introduction to C++ – classes – access specifier – function and data members – default arguments –friend functions – const and volatile functions - static members – Objects – pointers and objects – constant objects – nested classes- constructors – types of constructor –destructors.

**UNIT II POLYMORPHISM AND INHERITANCE 9**

Compile time polymorphism- function overloading –operator overloading –overloading through member functions and friend functions – type conversion - Runtime Polymorphism – virtual function – pure virtual functions – abstract class - RTTI- Inheritance –types of Inheritance – virtual base class.

**UNIT III TEMPLATES, EXCEPTION HANDLING AND FILES 9**

Templates –Types of templates - Exception handling – try-catch-throw paradigm– exception specification – terminate and Unexpected functions – Uncaught exception - Streams and formatted I/O – I/O manipulators - file handling – object serialization – namespaces - Standard template library.

**UNIT IV JAVA OOPS CONCEPTS 9**

Data types – Variables – Arrays – Operators - Control statements - Classes, objects, and methods - Method overloading and overriding – Inheritance - Super classes- sub classes –Protected members – constructors in sub classes – the Object class – abstract classes and methods- final methods and classes Interfaces and packages.

**UNIT V ADVANCED JAVA PROGRAMMING 9**

Exception handling - built-in exceptions - creating own exceptions - Multithreaded programming - thread life cycle, creating threads, Inter-thread communication - The I/O classes – Generics - String handling.

**TOTAL : 45 PERIODS**

## OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Apply the concepts of object oriented programming for practical problem solutions.	2
CO2	Apply generic data type for the data type independent programming which relates to reusability	3
CO3	Design the exception handling techniques for resolving run-time errors and handle large data set using file I/O	3
CO4	Develop Java programs using object oriented concepts	3
CO5	Design and develop real world problems in Java.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

## TEXT BOOKS

1. B. Trivedi, —Programming with ANSI C++, Second Edition, Oxford University, Press, 2012.
2. Herbert Schildt, Java: The Complete Reference, Eleventh Edition, 11th Edition, McGraw-Hill, 2018.

## REFERENCES

1. Deitel and Deitel, “C++ How to Program”, Tenth Edition, Pearson Education, 2017
2. Paul Deitel, Harvey Deitel, —Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
3. Herbert Schildt, —C++: The Complete Reference, Fourth Edition, McGraw Hill, 2013
4. Bjarne Stroustrup, "The C++ programming language", Fourth Edition, Addison Wesley, 2013.
5. Ira Pohl, — Object oriented programming using C++, Second Edition, Pearson Education Asia, 2012

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	3	3	3	-	-	-	-	-	-	-	3	3	3
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3	-	3	3	3	-	-	-	-	-	-	-	3	3	3
4	3	3	3	-	3	-	-	-	-	-	-	3	2	3
5	3	3	3	-	3	-	-	-	-	-	-	3	2	3

3-High, 2-Medium, 1-Low, '-' – no correlation



**AD22211**

**DATA STRUCTURES AND ALGORITHM  
ANALYSIS LABORATORY**

L	T	P	C
0	0	3	1.5

**OBJECTIVES**

The students should be able to:

- Learn the applications of different linear data structures
- Understand the tree data structures and its representation
- Implement the graph algorithms and its applications

**LIST OF EXPERIMENTS**

1. Sorting - Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort, Bucket Sort
2. Searching Linear Search, Binary Search
3. List - Array and Linked List Implementation
4. Stack - Array and Linked List Implementation
5. Queue - Array and Linked List Implementation
6. Applications of Stack - Infix to Postfix Expression, Evaluation of Postfix Expression
7. Hashing Implementation of Separate chaining and Open Addressing (Linear Probing)
8. Binary Search Tree with Tree traversal Techniques – Preorder, Post order and In order
9. AVL tree
10. Binary Heap
11. String Matching algorithms
12. Graph Traversal Algorithm Breadth-first search, Depth-first search
13. Shortest Path Algorithm Dijkstra's algorithm, Floyd – Warshall's algorithm
14. Minimum Spanning Tree - Kruskal's algorithm, Prim's algorithm

**TOTAL : 45 PERIODS**

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Standalone desktops with C / C++ and Java compiler 30 Nos. (or) Server with C/C++ and Java compiler supporting 30 terminals or more



**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Understand the applications of linear data structure to solve the real word problems.	2
CO2	To perform various traversals in tree data structure.	3
CO3	Demonstrate the use of graph algorithms for the shortest path finding problems to find shortest path using graph algorithms.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	3	-	-	-	3	-	-	3	3	3
2	3	3	3	3	3	-	-	-	3	-	-	3	3	3
3	3	3	3	3	3	-	-	-	3	-	-	3	3	3

3-High, 2-Medium, 1-Low

AD22212

**OBJECT ORIENTED PARADIGM AND  
PROGRAMMING LABORATORY**

L	T	P	C
0	0	3	1.5

**OBJECTIVES**

This course will develop the student's ability to

- Be familiarized with good programming design methods
- To get a clear understanding of object-oriented concepts
- To understand object oriented programming through C++ and JAVA
- Getting exposure in implementing various OOPS Concepts
- Appreciate recursive algorithms

**LIST OF EXPERIMENTS**

Implement the following topics:

**C++**

1. Programs using functions
  - Functions with default arguments
  - Implementation of call by value, call by address and call by reference
  - Friend function
2. Classes with data members, member functions, constructors and destructors
  - Static data member and static member function
  - Const data member and const member function
  - Constructors and destructors
3. Compile time polymorphism
  - Function Overloading
  - Unary and Binary Operator Overloading using member functions
  - Unary and Binary Operator Overloading using friend functions
4. Inheritance
  - Single Inheritance
  - Multiple Inheritance
  - Multilevel Inheritance
  - Hierarchical Inheritance
  - Hybrid Inheritance
5. Runtime Polymorphism
  - Virtual functions
  - Pure virtual functions
  - Virtual base class
  - Type conversion
6. Templates
  - Function Templates
  - Class Templates
7. Exception Handling
8. File Handling
  - Sequential access

- Random access
- 9. RTTI
- 10. Standard Template Library

**Java**

- 11. Simple Java application
  - for understanding references to an instant of a class
  - handling strings in JAVA
- 12. Package creation
  - Handling in built packages
  - Creating user defined packages
- 13. Interfaces
  - developing user defined interfaces
  - use predefined interfaces
- 14. Threading
  - creation of threading in java applications
  - multi-threading
- 15. Exception handling
  - Handling pre-defined exceptions
  - Handling user-defined exceptions

**TOTAL : 45 PERIODS**

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Standalone desktops with C++ compiler 30 Nos. or Server with C++ compiler supporting 30 terminals or more

**OUTCOMES:**

CO	CO statements	RBT level
	<b>Upon successful completion of the course, the students should be able to</b>	
CO1	Students will be able to solve real world problems using C++ and Java.	3
CO2	Understand various exception handling mechanisms.	2
CO3	To develop multi-threading applications using java.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

## COURSE ARTICULATION MATRIX

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3	3	3	3	3	3	-	-	-	3	-	-	2	3	3

3-High, 2-Medium, 1-Low



L	T	P	C
3	1	0	4

**OBJECTIVES**

The student should be made to:

- Understand the basic concepts of the probability and to apply the same for Engineering Problems
- Understand the fundamentals of one and two dimensional random variables and to introduce some standard distributions applicable to data science.
- Select the appropriate statistical procedure and apply relevant statistical tests depending on the data provided.
- Analyze the various designs of experiments.
- Become familiar with basic methods of statistical process control.

**UNIT I DESCRIPTIVE STATISTICS AND PROBABILITY 9+3**

Introduction – Measures of central tendency-Mean, Median, Mode – Measures of Dispersion – Range, Interquartile range, Standard deviation – Probability – Axioms of probability – Conditional probability – Bayes' theorem.

**UNIT II RANDOM VARIABLES 9+3**

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson and Normal distributions. Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Central limit theorem (for independent and identically distributed random variables) – Applications using MATLAB (only for assignment).

**UNIT III TESTING OF HYPOTHESIS 9+3**

Sampling distributions – Population and Samples – Estimation of parameters – Statistical hypothesis - Large sample test based on Normal distribution for single mean, single proportion, difference of means and difference of proportions – Small sample test based on t, F and chi-square distributions for mean, variance - Tests for independence – Goodness of fit.

**UNIT IV ANALYSIS OF VARIANCE 9+3**

Basic principles of experimentation-Analysis of variance-One-way classification – Completely Randomised design - Two-way classifications - Randomised block design-Multiple comparison- Latin square design-problems.

**UNIT V STATISTICAL QUALITY CONTROL 9+3**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

**TOTAL (L:45+T:15): 60 PERIODS**

**OUTCOMES:**

<b>CO</b>	<b>CO statements</b> <b>Upon successful completion of the course, the students should be able to</b>	<b>RBT Level</b>
<b>CO1</b>	Acquire fundamental knowledge of the concepts of probability.	
<b>CO2</b>	Achieve an understanding of standard distributions which is more relevant to Data Science and its applications	
<b>CO3</b>	Test a hypothesis by measuring and examining a random sample of the population.	
<b>CO4</b>	Classify and apply the related analysis of variance techniques in all fields of scientific experimentation.	
<b>CO5</b>	Apply statistical quality control theory on real time problems.	

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**TEXT BOOKS**

1. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1<sup>st</sup> Indian Reprint, 2010.
2. Richard A J, Irwin Miller, John Freund, Miller and Freund's - Probability and Statistics for Engineers, Pearson Education, Asia, 9<sup>th</sup> Edition, 2020.

**REFERENCES**

1. Johnson. R.A. and Gupta. C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th Edition, 2007.
2. Walpole R E, Myres, R H, Myres SL and Ye K, Probability and Statistics for Engineers and Scientists, Pearson Education, Asia, Eighth Edition, 2011.
3. Spiegel M R, Schiller J and Srinivasan R A, Schaum Outline of Theory and Problems of Probability and Statistics, Tata McGraw Hill Edition, 2004.

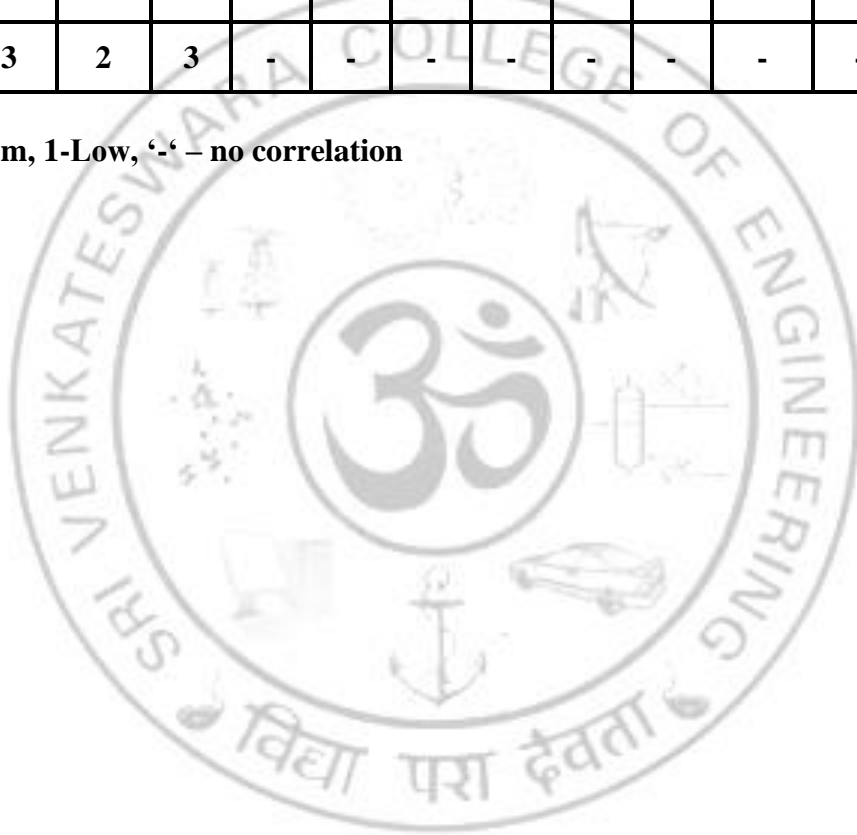
**Web Link:**

1. <https://nptel.ac.in/courses/103/106/103106112/>
2. <https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/lecture-notes/>

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2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
3	3	3	2	3	-	-	-	-	-	-	-	-	-	2
4	3	3	2	3	-	-	-	-	-	-	-	-	-	2
5	3	3	2	3	-	-	-	-	-	-	-	-	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation



**AD22301**

**ARTIFICIAL INTELLIGENCE**

(Common to AD & CS)

L	T	P	C
3	0	0	3

**OBJECTIVES**

The main objectives of this course are to:

- Learn the basic AI approaches to develop problem solving agent
- Learn game playing
- Perform knowledge representation in Logic
- Perform probabilistic reasoning under uncertainty
- Perform Planning and Controlling Uncertain movements in robots

**UNIT I PROBLEM-SOLVING**

**9**

Foundations of Artificial Intelligence, History of Artificial Intelligence, State of the Art, Risk and Benefits of AI; Intelligent Agents – Agents and Environments, Concept of Rationality, Nature of Environments, Structure of Agents; Problem-solving – Problem-Solving Agents, Search Algorithms, Uninformed Search Strategies, Informed Search Strategies, Heuristic Functions

**UNIT II ADVERSARIAL SEARCH**

**9**

Game Theory, Optimal Decisions in Games, Heuristic Alpha-Beta Tree Search, Monte Carlo Tree Search, Stochastic Games; Constraint Satisfaction Problems – Inference, Backtracking Search and Local Search and Structure of Problems

**UNIT III KNOWLEDGE, REASONING AND PLANNING**

**9**

Logical Agents - Knowledge-based agents, Logic, Propositional Logic; First-Order Logic – Representation, Syntax and Semantics, Using First-Order Logic; Inference in First-Order Logic – Unification, Forward Chaining, Backward Chaining, Resolution

**UNIT IV UNCERTAIN KNOWLEDGE AND REASONING**

**9**

Quantifying Uncertainty – Acting under Uncertainty, Inference using Full Joint Distributions, Bayes' Rule, Naive Bayes Model; Probabilistic Reasoning – Representing Knowledge in an Uncertain Domain, Semantics of Bayesian Networks, Exact Inference, Approximate Inference in Bayesian Networks; Probabilistic Reasoning Over Time – Inference in Temporal Models, Hidden Markov Models

**UNIT V ROBOTICS**

**9**

Reinforcement Learning – Learning from Rewards, Passive and Active Reinforcement Learning, Policy Search, Applications; Robotics – Robots, Robots Hardware, Robotic Perception, Planning and Control, Planning Uncertain Movements, Reinforcement Learning in Robotics, Humans and Robots, Robotic Frameworks, Application Domains

**TOTAL : 45 PERIODS**



## OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Apply intelligent agent frameworks for toy problems	3
CO2	Apply search algorithms for game playing	3
CO3	Perform logical reasoning	3
CO4	Perform probabilistic reasoning under uncertainty	3
CO5	Learn robotic frameworks for various application domains	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

## TEXT BOOKS

1. Stuart Russell and Peter Norvig, Artificial Intelligence : A Modern Approach, Pearson, 4th Edition, 2020

## REFERENCES

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013
5. <https://nptel.ac.in/>

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4	3	-	3	3	3	-	-	-	-	-	-	3	3	3
5	3	3	3	-	3	-	-	-	-	-	-	3	3	3

3-High, 2-Medium, 1-Low, '-' – no correlation

## DATABASE MANAGEMENT SYSTEMS

CS22301

(Common to CS & AD)

L	T	P	C
3	0	0	3

### OBJECTIVES

- To learn the fundamentals of data models and to represent a database system using ER diagrams
- To learn the Relational Algebra, SQL queries and advanced SQL features
- To learn the concepts of Functional dependencies and Normalization
- To understand the fundamental concepts of transaction, concurrency and recovery processing
- To study the various data storage and indexing techniques and cloud databases

### UNIT I DATABASE DESIGN

9

Purpose of Database Systems - View of Data - Database System Architecture - Database Languages - Entity Relationship Model – Constraints - Entity Sets – Attributes – Keys - ER Diagrams - Design Issues – Extended ER Features - Introduction of Relational Model – ER Reduction to Relational Schemas

### UNIT II RELATIONAL DATABASE MODELS

9

Structure of Relational Databases – Schema Diagrams – Relational Query Languages - Relational Algebra – Integrity Constraints - Basic Queries in SQL – Set Operations – Aggregate Operations – Sub Queries - Joins – Views – Authorization – Advanced SQL – Triggers – Functions and Procedures– Embedded SQL – Dynamic SQL

### UNIT III RELATIONAL DATABASE DESIGN

9

Functional Dependencies and Keys – Closure of Functional Dependencies Set – Closure of attributes - Dependency Preservation - Decomposition using functional dependencies – Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Multivalued Dependencies - Decomposition using Multivalued dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form.

### UNIT IV TRANSACTION MANAGEMENT

9

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit -- Save Points – Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Recovery Isolation Levels

### UNIT V DATA STORAGE TECHNIQUES

9

Overview of Physical Storage Media – 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 - Cloud Databases

**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Design database using Entity Relationship model and construct ER diagrams for enterprise databases	2
CO2	Construct queries using Relational Algebra and SQL with advanced features	4
CO3	Normalize the databases to reduce cost due to data redundancy	3
CO4	Analyze the basic issues of transaction processing and maintain consistency of the databases.	3
CO5	Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the modern databases	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**TEXT BOOKS**

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", McGraw Hill, Seventh Edition, 2019.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Pearson Education/Addison Wesley, Seventh Edition, 2021.

**REFERENCES**

1. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education, Fifth Edition, 2009.
2. C. J. Date, A. Kannan and S. Swamynathan, "An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006.
3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition, 2004.
4. G.K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
5. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T. Snodgrass, V.S. Subrahmanian, Roberto Zicari, "Advanced Database Systems", Morgan Kaufmann publishers, 2006.

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	-	-	-	-	-	-	3	-	3	3
2	3	3	3	3	-	-	-	-	-	-	-	-	3	2
3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
4	3	3	3	3	-	-	-	-	-	-	-	-	3	3
5	3	3	3	3	3	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low



CS22302

**DATAMINING AND DATAWAREHOUSING**

(Common to CS & AD)

L	T	P	C
3	0	0	3

**OBJECTIVES**

- To introduce students to the basic concepts and techniques of Data Mining and various classification techniques.
- To understand frequent pattern and association rule mining techniques for data analysis.
- To understand and apply various clustering techniques.
- To understand data warehouse concepts, architecture and schema.
- To understand various types of online analytical processing techniques.

**UNIT I DATA MINING INTRODUCTION AND CLASSIFICATION**

**9**

Introduction to Data Mining-Need-Applications-Process-Techniques-Predictive modeling-Database segmentation, Link analysis and Deviation detection-Data Preprocessing-Classification-Introduction and Types of Classification-Input and Output Attributes-Working of Classification-Guidelines for Size and Quality of the Training Dataset-Decision Tree Classifier-Introduction, Building decision tree using Information gain-Building a decision tree with Gini Index-Naïve Bayes Method-Understanding Metrics to Assess the Quality of Classifiers.

**UNIT II ASSOCIATION MINING**

**9**

Introduction-Defining Association Rule Mining-Representations of Items for Association Mining-The Metrics to Evaluate the Strength of Association Rules-The Naïve Algorithm for Finding Association Rules-The Apriori Algorithm -Closed and Maximal Itemsets – The Apriori-TID Algorithm for Generating Association Mining Rules-Direct Hashing and Pruning-Dynamic Itemset Counting-Mining Frequent Patterns without Candidate Generation.

**UNIT III CLUSTER ANALYSIS**

**9**

Cluster Analysis-Introduction-Applications-Desired Features of Clustering-Distance Metrics-Major Clustering Methods-Partitioning Clustering-k-means clustering-Hierarchical Clustering Algorithms-Agglomerative clustering-Divisive clustering-Density-based clustering-DBSCAN algorithm-Strengths of DBSCAN algorithm-Weakness of DBSCAN algorithm.

**UNIT IV DATA WAREHOUSING & DATA MODELING**

**9**

Data Warehouse-Historical developments-Defining data warehousing-Data warehouse architecture-Benefits of data warehousing-Data Marts-Data warehouses versus OLTP: similarities and distinction-Data Warehouse Schema-Introduction to Data Warehouse Schema-Dimension-Measure-Fact Table-Multi-dimensional view of data-types-Star Schema-Snowflake Schema-Fact Constellation Schema.

## UNIT V ONLINE ANALYTICAL PROCESSING

9

Introduction-Defining OLAP-OLAP applications-Features of OLAP-OLAP Benefits-Strengths of OLAP-Comparison between OLTP and OLAP-Differences between OLAP and data mining-Representation of Multi-dimensional Data-Data Cube-Improving efficiency of OLAP by pre-computing the queries-Types of OLAP Servers-Relational OLAP and MOLAP-Comparison of ROLAP and MOLAP-OLAP Operations.

**TOTAL : 45 PERIODS**

### OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Understand data mining concepts and apply classification techniques.	2
CO2	Do data analysis using frequent pattern and association rule mining techniques.	3
CO3	Students will be able to apply various clustering techniques.	3
CO4	Students will be able to understand data warehouse concepts, architecture and schema.	2
CO5	Students will be able to understand various types of online analytical processing techniques.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

### TEXT BOOKS

1. Parteek Bhatia, Data Mining and Data Warehousing: Principles and Practical Techniques, Cambridge University Press, 2019.

### REFERENCES

1. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
2. Alex Berson and Stephen J. Smith, —Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 35th Reprint 2016.
3. K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
4. Ian H. Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition
5. Pang, N. T., Steinbach, M. and Kumar, V., “Introduction to Data Mining”, Pearson Education

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	2	-	-	-	3	-	-	3	3	3
2	3	3	3	3	3	-	-	-	3	-	-	3	3	3
3	3	3	3	3	3	-	-	-	3	-	-	3	3	3
4	3	3	3	3	3	-	-	-	3	-	-	3	3	3
5	3	3	3	3	2	-	-	-	3	-	-	3	3	3

3-High, 2-Medium, 1-Low



CS22201

**PYTHON FOR DATA SCIENCE**  
(Common to CS & AD)

L	T	P	C
3	0	2	4

**OBJECTIVES**

The Student should be made to:

- Acquire knowledge on the mathematical background for understanding data science.
- Learn the basics of Python programming.
- Be familiar in performing array manipulation using NumPy.
- Understand the concepts of storing, retrieving and manipulating data using Pandas.
- Create appealing plots to understand the trend and pattern of data in the simple and efficient way.

**UNIT I STATISTICS FOR DATA SCIENCE 9+6**

Descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates.

**UNIT II INTRODUCTION TO PYTHON 9+6**

Types and Operation: Numeric Types, String Fundamentals, List and Dictionaries, Tuples, Files, Statements: Assignments, Expressions, if tests, while and for loops, Functions: Function Basics, Scopes, Arguments, Modules: Module Coding Basics, Module Packages.

**UNIT III INTRODUCTION TO NUMPY 9+6**

Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything in Between Computation on Arrays, Comparisons, Masks, and Boolean, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays.

**UNIT IV DATA MANIPULATION WITH PANDAS 9+6**

Installing and Using Pandas, Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append, Combining Datasets: Merge and Join, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas: eval() and query().

**UNIT V VISUALIZATION WITH MATPLOTLIB 9+6**

Matplotlib, Simple Line Plots, Simple Scatter, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends, Customizing Colorbars, Multiple Subplots, Text and Annotation, Customizing Ticks, Customizing Matplotlib: Configurations and



Stylesheets, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Visualization with Seaborn.

**TOTAL (L:45+P:30): 75 PERIODS**

**OUTCOMES:**

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Students will be able to understand the mathematical foundation for data science.	2
CO2	Students will be able to solve computational problems in python.	3
CO3	Students will be able to handle python arrays using NumPy package.	3
CO4	Students will be able to manipulate data using Pandas.	3
CO5	Students will be able to understand the pattern of data by graphical displays using Matplotlib.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

**LIST OF EXPERIMENTS:**

1. Write a python program to perform all statistical operations using statistics package.
2. Write a python program to remove the punctuations from the string.
3. Write a python function to print the sum of numbers if and only if the number is even.
4. Write a python module to perform binary search.
5. Write a python program to create a structured array using NumPy containing employee details such as employee name, department, designation and salary. Now sort by name, if the salary is greater than 25000.
6. Write a python program to create structured arrays using NumPy containing student details such as student name, register number, marks in 5 subjects. Apply aggregation function to implement the following:
  - i. Find the total marks, average marks of each student.
  - ii. Identify the maximum and minimum mark subjectwise.
  - iii. Find the topper of the class.
  - iv. Find the pass percentage for each subject.
  - v. Find the class pass percentage.
7. Write a python program to create a dataframe using pandas. Perform the following operations on the dataframe.
  - i. Data Selection
  - ii. Data Indexing
  - iii. Handling missing data in nominal attributes

- iv. Handling missing data in numeric attributes
  - v. Grouping operations
8. Write a python program to implement the following plots using Matplotlib
- i. Line plot
  - ii. Scatter plot
  - iii. Density plot
  - iv. Box plot
  - v. Histogram

### TEXT BOOKS

1. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, Sixth Edition, Wiley Publication, 2016.
2. Mark Lutz, Learning Python, Fifth Edition, O'Reilly Publication, 2013. (Revised in 2020)
3. Jake VanderPlas, Python Data Science Handbook - Essential Tools for Working with Data, Second Edition, O'Reilly Publication, 2022.
4. Wes McKinney, Python for Data Analysis, Third Edition, O'Reilly Publication, 2022.
5. David Beazley and Brian K. Jones, Python Cookbook, Third Edition, O'Reilly Publication, 2013.

### COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3							3	3		3		3
2	3	3	3						3			3	3	3
3	3	3	2						2	3		3	3	
4	3	3										3		3
5	3	3								3		3	3	

3-High, 2-Medium, 1-Low, '-' – no correlation

**CS22202      DIGITAL PRINCIPLES AND SYSTEM DESIGN**

(Common to CS &amp; AD)

L	T	P	C
3	0	0	3

**OBJECTIVES**

- To understand various number systems, different methods are used for the simplification of Boolean functions.
- To design and implement a system that uses combinational logic for the given specification; Simulate combinational logic systems using Verilog or VHDL
- To design and implement a synchronous sequential system for the given specification; Simulate sequential logic systems using Verilog or VHDL.
- To design and implement memory accessing systems and systems using PLA, PAL.
- To use RTL notation for describing register operations in a clocked sequential circuit.

**UNIT I      BOOLEAN ALGEBRA AND LOGIC GATES      9**

Digital Systems - Binary Numbers - Number Base Conversions - Complements of Numbers - Introduction to Boolean Algebra and Boolean Functions - Canonical and Standard Forms - Digital Logic Gates - Integrated Circuits

**UNIT II      COMBINATIONAL CIRCUITS      9**

Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers and De-Multiplexers – Tri-State Gates – HDL Models of Combinational Circuits

**UNIT III      SYNCHRONOUS SEQUENTIAL LOGIC      9**

Introduction - Latches and Flip Flops – Analysis of Clocked Sequential Circuits and Design Procedures – State Diagram, State Table - State Reduction & Assignment - Shift Registers – Ripple Counters – Synchronous Counters

**UNIT IV      MEMORY AND PROGRAMMABLE LOGIC      9**

RAM - Memory Decoding – Error Detection and Correction - ROM – Programmable Logic Array – Programmable Array Logic

**UNIT V      DESIGN AT THE REGISTER TRANSFER LEVEL      9**

Introduction - RTL Notation - RTL Description - Algorithmic State Machine - Design Example (ASMD Chart) - Design of Sequential Binary Multiplier

**TOTAL (L:45): 45 PERIODS**

## OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Students will be able to learn the different types of number systems and simplification of Boolean functions	1
CO2	Students will be able to understand various logic gates and their usage	2
CO3	Students will be able to study, analyze and design various combinational circuits and its implementation using VHDL	4
CO4	Students will be able to understand the different type of memory and their structures	2
CO5	Students will be able to study, analyze of RTL notation register operations in a clocked sequential circuit	4

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

## TEXT BOOKS

1. “Digital Design with An Introduction to Verilog HDL, VHDL and System Verilog” by M. Morris Mano and Michael D. Ciletti, 6th Edition, Pearson, 2017.

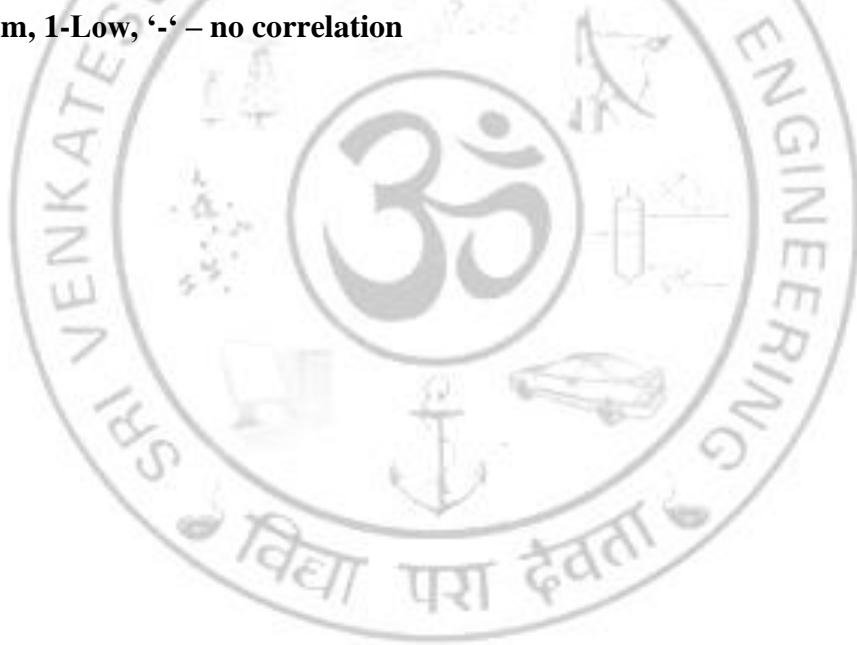
## REFERNCES

1. John F. Wakerly, “Digital Design Principles and Practices”, Fourth Edition, Pearson Education, 2007
2. Charles H. Roth Jr, “Fundamentals of Logic Design”, Fifth Edition – Jaico Publishing House, Mumbai, 2003
3. Donald D. Givone, “Digital Principles and Design”, Tata Mcgraw Hill, 2003
4. Kharate G. K., “Digital Electronics”, Oxford University Press, 2010.
5. <http://www.learnabout-electronics.org/Digital/dig44.php>

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	-	-	-	-	-	-	-	-	3	3	3
2	3	3	3	-	3	-	-	-	-	-	-	-	2	3
3	3	3	3	-	3	-	-	-	-	-	-	-	3	3
4	3	3	3	-	-	-	-	-	-	-	-	3	3	2
5	3	3	3	-	3	-	-	-	-	-	-	3	3	3

3-High, 2-Medium, 1-Low, '-' – no correlation



CS22311

**DATABASE MANAGEMENT SYSTEMS  
LABORATORY**

(Common to CS & AD)

L	T	P	C
0	0	3	1.5

**OBJECTIVES**

- To identify different issues involved in the design and implementation of a database system for real time applications
- To identify exact queries to extract information from the database
- To work with PL/SQL features

**LIST OF EXPERIMENTS**

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Creation of Procedures.
9. Creation of database triggers and functions
10. Database Connectivity with Front End Tools
11. Case study of Big Data and NoSQL.
12. Mini project
  - Inventory Control System.
  - Material Requirement Processing.
  - Hospital Management System.
  - Railway Reservation System.
  - Personal Information System.
  - Web Based User Identification System.
  - Timetable Management System.
  - Hotel Management System

**TOTAL : 45 PERIODS**

## LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

### HARDWARE:

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

### SOFTWARE:

OS: Fedora / Linux, Hadoop package.

Front end: VB/VC ++/JAVA or Equivalent,

Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent.

### OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Design and implement a database schema for given problem statement.	2
CO2	Develop PL/SQL blocks such as stored procedures, stored functions, cursors, packages	3
CO3	Make the database connectivity using front-end tools for various real time applications.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

### COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	-	-	3	-	3	-	3	3
2	3	-	3	3	-	-	-	-	3	-	3	-	3	3
3	3	-	3	3	3	-	-	-	3	-	3	-	3	3

3-High, 2-Medium, 1-Low

**AD22311 ARTIFICIAL INTELLIGENCE LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**OBJECTIVES**

- To design and implement search strategies.
- To implement game playing and CSP techniques.
- To develop systems with logical and probabilistic reasoning.

**LIST OF EXPERIMENTS**

1. Implement intelligent agents – Vacuum World Problem
2. Implement basic search strategies – 8-Puzzle, 8 - Queens problem
3. Implement A\* algorithm – Route-Finding problem
4. Implement Minimax algorithm for game playing (Alpha-Beta pruning)
5. Solve constraint satisfaction problems (Cryptarithmic, MapColouring)
6. Study of Prolog
7. Implement forward chaining, backward chaining, and resolution strategies in First-order logic
8. Building Naive Bayes model
9. Probabilistic Inferencing in Bayesian Network
10. Implementation of policy search in Reinforcement learning

**TOTAL : 45 PERIODS****LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Standalone desktops with C/C++/Java/Python/Prolog/JESS compiler 30 Nos.

**OUTCOMES:**

<b>CO</b>	<b>CO statements</b>	<b>RBT level</b>
<b>CO1</b>	Upon successful completion of the course, the students should be able to Design and implement search strategies	<b>3</b>
<b>CO2</b>	Implement game playing and CSP techniques	<b>3</b>
<b>CO3</b>	Develop logical reasoning and probabilistic systems	<b>3</b>

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create



## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	-	-	-	-	3	3	2	3	3	2
2	3	2	3	3	3	-	-	-	3	2	3	3	3	3
3	3	3	3	3	3	-	-	-	3	3	3	3	3	3

3-High, 2-Medium, 1-Low

