PROGRAM STRUCTURE

AND

SYLLABUS

INFORMATION TECHNOLOGY

For

B. Tech FOUR YEARS DEGREE PROGRAM

(Applicable for batches admitted from 2024-2025)

D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)

(Accredited with A^{++}Grade by NAAC & Accredited by NBA(B. Tech- CSE, ECE & EEE))

BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

Ph: 08816-221238, Email: dnrcet@gmail.com , Website: https://dnrcet.org

Phone: 08816-221237

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Dr. B. V. Ram Kumar
M.E., PhD., MCSI, MISTE.
Professor & HoD, IT

BHIMAVARAM
W. G. DIST (AP)
PIN: 534202

CIRCULAR

Ref: *DNRCET/IT/2024-25/BoS/C-1* **Date:** *20.03.2025*

It is to inform all BoS members of the department of Information Technology to attend the BoS meeting to be conducted ***on 24th March, 2025*** at ***11:30 am.*** The following agenda is being discussed.

Agenda:

1. Introducing the members of Board of Studies.
2. Discussion on II year Semester I & II course structure for B. Tech (Information Technology) Program for the academic year 2025 – 26.
3. Discussion on preparation of course syllabus in accordance to JNTUK course structure and syllabus.
4. Discussion on Academic Regulations of the UG Program.
5. Discussion and finalizing the model papers for the academic year 2025 – 26.
6. To discuss the Certificate Courses to be done by the students & staff.
7. To discuss the functional MoUs with the industries.
8. To discuss the feasibility of developing collaborations with other institutions.
9. To evolve a plan of action for consultancy activities.
10. Any other agenda with the permission of the chair.

20/3/25

Chairperson Board of Studies /
Head of the Department

Head of the Dept.
D.N.R. College of Engg. & Tech.
BHIMAVARAM-534 202.

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Department of Information Technology

Date: 20.03.2025

To
Dr. N. Ramakrishnaiah,
Professor,
CSE Department,
UCEK, JNTUK Kakinada,
Kakinada – 533003.

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of Information Technology – Board of Studies Meeting – Reg.

We take the privilege in inviting you for the Board of Studies Meeting of Department of Information Technology, DNR College of Engineering & Technology as an Expert Nominated by Vice-Chancellor, JNTUK, Kakinada. It is proposed to discuss and finalize the course structure and syllabi for the 2nd year of DR24 B. Tech (IT) course curriculum.

In this regard, you are requested to attend the meeting scheduled to be held on **24.03.2025** at **11.30 AM** in online mode.

Kindly accept our invitation and make it convenient to attend the Board of Studies meeting.

Thanking You Sir

Yours Sincerely,

Chairperson Board of Studies /
Head of the Department

Head of the Dept.
Department of IT
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Department of Information Technology

Date: 20.03.2025

To

Dr. V. Chandrasekhar,
Professor & Dean,
Department of Computer Science & Engineering,
S. R. K. R. Engineering College (A),
BHIMAVARAM 534202.

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of Information Technology – Board of Studies Meeting – Reg.

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Department of Information Technology

Date: 20.03.2025

To
Dr. V. Purushotham Raju,
Professor & HoD,
Department of Computer Science & Engineering,
Shri Vishnu Engineering College for Women (A),
Bhimavaram, W.G. Dist., A.P.

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of Information Technology – Board of Studies Meeting – Reg.

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Department of Information Technology

Date: 20.03.2025

To

Rajiv Chand Kakarla
CEO, Amaravathi Software Innovations
Rajahmundry,
East Godavari District, A.P.,

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of Information Technology – Board of Studies Meeting – Reg.

We take the privilege in inviting you for the Board of Studies Meeting of Department of Information Technology, DNR College of Engineering & Technology as an Expert Nominated by Vice-Chancellor, JNTUK, Kakinada. It is proposed to discuss and finalize the course structure and syllabi for the 2nd year of DR24 B. Tech (IT) course curriculum.

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Dr. B. V. Ram Kumar
M.E., PhD., MCSI, MISTE.
Professor & HoD,

Department of Information Technology
E-Mail: bvrk.bonam@gmail.com
Mobile: +91-9492232152, Phone: 08816-221237

List of members of Board of Studies

S. No.	Category	Name	Position	Signature
1	Chairperson	Dr. B. V. Ram Kumar	Professor & HoD Department of IT DNRCET, Bhimavaram	
2	Expert Nominated by Vice-Chancellor	Dr. N. Ramakrishnaiah	Professor, CSE Department, UCEK, JNTUK Kakinada, Kakinada – 533003.	
3	Subject Experts from outside Parent Universities	Dr. V. Chandrasekhar,	Professor & Dean, Department of CSE, S. R. K. R. Engineering College (A), BHIMAVARAM 534202.	20/3/24
4		Dr. V. Purushotham Raju	Professor & Dean Academics, Department of Computer Science & Engineering, Shri Vishnu Engineering College for Women (A), Bhimavaram, W.G. Dist., A.P.	24/3/24
5	Member (Industrial Expert)	Rajiv Chand Kakarla	CEO, Amaravathi Software Innovations, Rajahmundry, East Godavari District, A.P.,	E-Mail
6	Members Secretary	Mr. B. Ravi Kiran	Assistant Professor, Department of IT, DNRCET, Bhimavaram.	
7	Faculty Members	Mr. J.V.S. Nageswar Rao	Assistant Professor, Department of IT, DNRCET, Bhimavaram.	

8	Member (College alumni)	Mrs. G. Jahnavi Deepika	Mrs. G. Jahnavi Deepika Assistant Professor, Department of Computer Science & Engineering, Mallareddy Engineering College for Women (A), Hyderabad.	

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DEPARTMENT OF INFORMATION TECHNOLOGY

Ref: *DNRCET/IT/2024-25/BoS/MoM-1* **Date:** *24.03.2025*

Board of Studies (BoS) Minutes of Meeting

24th MARCH, 2025 at 11:30 am.

Agenda:

1. Introducing the members of Board of Studies.
2. Discussion on II year Semester I & II course structure for B. Tech (Information Technology) Programs for the academic year 2025 – 26.
3. Discussion on preparation of course syllabus in accordance to JNTUK course structure and syllabus.
4. Discussion on Academic Regulations of both UG Program.
5. Discussion and finalizing the model papers for the academic year 2025 – 26.
6. To discuss the Certificate Courses to be done by the students & staff.
7. To discuss the functional MoUs with the industries.
8. To discuss the feasibility of developing collaborations with other institutions.
9. To evolve a plan of action for consultancy activities.
10. Any other agenda with the permission of the chair.

The Board of Studies meeting held on 24th March, 2025 at 11:30 am through online & offline mode with the welcome speech by Dr. B. V. Ram Kumar, Professor & Head of the department / Chairperson of BoS.

The points mentioned in the agenda were discussed, and the details are listed below:

Agenda No. 1: The Board of Studies (BoS) for Department of Information Technology is constituted by the chairperson as per the guidelines of Academic Council. The Chairperson introduced all nominated Board of Studies members of department of Information Technology to each other.

Agenda No. 2, 3, 4: The BoS members discussed on the agenda 2, 3, 4 and made the following resolutions.

Resolution on Agenda 2, 3, 4:

The members of the Board of Studies (BoS) and the chairperson made the decision to follow the JNTUK, Kakinada R-23 regulations for B. Tech Program were put into place for second year students for the academic year 2025-2026. This included adhering the academic regulations, syllabi, model papers, and the evaluation procedure for semester-end examinations (SEE) and continuous internal evaluation (CIE).

Agenda No.5: The BoS members discussed on the agenda 5 and made the following resolutions.

Resolution on Agenda 5:

As it is decided to adhere JNTUK, Kakinada R-23 model paper without any change in agenda 5. The chairperson of the BoS discussed and finalized with the model paper with two sections. Section- A consists of 10 small questions, each carry 2 marks and it should be 2 from each unit. The Section-B consists of five question with internal choice which carry 10 marks each and it should be each from one unit of the syllabus. All the members accepted unanimously and list is finalized and enclosed in Annexure G.

Agenda No.6: The BoS members discussed on the agenda 6 and made the following resolutions.

Resolution on Agenda 6:

To bridge the gap to academics and industry for 2nd year B.Tech., students from their previous learning method to problem solving method it is unanimously accepted to introduce the certificate courses to the student to improve their programming skills as well as increasing the concept of implementation skills.

Also accepted to introduce the certificate courses for the faculty members to enrich their knowledge levels in latest technological areas. All the members accepted unanimously and list is finalized and enclosed in Annexure H.

Agenda No.7: The BoS members discussed on the agenda 7 and made the following resolutions.

Resolution on Agenda 7:

To strengthen the students' skills conducting Guest Lectures, Workshops, Seminars and other co-curricular activities through MoUs with reputed organizations are required. Hence the BoS members agreed and advised to improve MoUs with reputed organizations/industries.

Agenda No.8: The BoS members discussed on the agenda 8 and made the following resolutions.

Resolution on Agenda 8:

To strengthen the department needs and to develop various skillset of the students it is advised to develop collaborations with the other institution. The BoS members advised to improve the collaboration with reputed institutions towards increasing technical workshops and FDP's and other mode of operations.

Agenda No.9: The BoS members discussed on the agenda 9 and made the following resolutions.

Resolution on Agenda 9:

To BoS members agree and advised to plan consultancy activities for the development of department.

Agenda No.10: As there is no other agenda for discussion; hence the chairperson advised to conclude the meeting with the permission of all the BoS members.

The entire meeting is recorded as video and stored in the department.

The meeting concluded at 1:00pm with a vote of thanks by Dr. B. V. Ram Kumar, Chairperson of BoS / Professor & Head of the department.

University Nominee

Chairperson Board of Studies / Head of the Department

Head of the Dept.
Department of IT
D.N.R. College of Engg. & Tech.
BHIMAVARAM-534 202.

Copy to:

1. Principal, DNRCET(A),
2. Dean, Academics, DNRCET(A),
3. Controller of Examinations, DNRCET(A),
4. Circulation among the faculty members, IT Department, DNRCET(A),
5. File.

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S. No.	Category	Name	Position	Signature
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6	Members Secretary	Mr. B. Ravi Kiran	Assistant Professor, Department of IT, DNRCET, Bhimavaram.	
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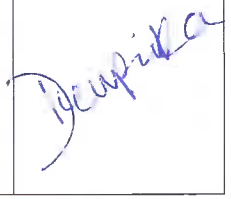
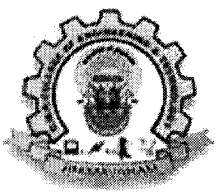
8	Member (College alumni)	Mrs. G. Jahnavi Deepika	Mrs. G. Jahnavi Deepika Assistant Professor, Department of Computer Science & Engineering, Mallareddy Engineering College for Women (A), Hyderabad.	

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE & SYLLABUS B. Tech IT for INFORMATION TECHNOLOGY PROGRAMME

(Applicable for batches admitted from 2024-2025)



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B. Tech. IT (DR24 Regulation I Year COURSE STRUCTURE & SYLLABUS)

B. Tech.–I Year I Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24BS1104	Engineering Physics	BS&H	3	0	0	3
2	BT24BS1103	Linear Algebra & Calculus	BS&H	3	0	0	3
3	BT24EE1101	Basic Electrical & Electronics Engineering	ES	3	0	0	3
4	BT24ME1102	Engineering Drawing	ES	1	0	4	3
5	BT24CS1101	Introduction to Programming	ES	3	0	0	3
6	BT24CS1102	IT Workshop	ES	0	0	2	1
7	BT24BS1107	Engineering Physics Lab	ES	0	0	2	1
8	BT24EE1102	Electrical & Electronics Engineering Workshop	ES	0	0	3	1.5
9	BT24CS1103	Computer Programming Lab	ES	0	0	3	1.5
10	BT24BS1109	NSS/NCC/Scouts & Guides/Community Service	BS&H	-	-	1	0.5
Total				**13**	**0**	**15**	**20.5**

B. Tech – I Year II Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24BS1201	Communicative English	BS&H	2	0	0	2
2	BT24BS1202	Chemistry	BS&H	3	0	0	3
3	BT24BS1204	Differential Equations & Vector Calculus	BS&H	3	0	0	3
4	BT24CE1201	Basic Civil & Mechanical Engineering	ES	3	0	0	3
5	BT24CS1201	Data Structures	PC	3	0	0	3
6	BT24BS1206	Communicative English Lab	BS&H	0	0	2	1
7	BT24BS1207	Chemistry Lab	BS&H	0	0	2	1
8	BT24ME1203	Engineering Workshop	ES	0	0	3	1.5
9	BT24CS1203	Data Structures Lab	PC	0	0	3	1.5
10	BT24BS1210	Health & Wellness, YOGA & Sports	BS&H	-	-	1	0.5
Total				**14**	**0**	**11**	**19.5**

(Dr. N. RAMA KRISHNAIAH)
Professor & Head
Dept. of Computer Science & Engineering

Head of the Dept.
Department of IT
D.N.R. College of Engg. & Tech.
BHIMAVARAM-534 202.

B. Tech. IT (DR24 Regulation II Year COURSE STRUCTURE & SYLLABUS)

B. Tech.–II Year I Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24BS2105	Discrete Mathematics & Graph Theory	BS&H	3	0	0	3
2	BT24HS2101	Universal human values – understanding harmony and Ethical human conduct	BS&H	2	1	0	3
3	BT24EC2107	Digital Logic & Computer Organization	ES	3	0	0	3
4	BT24CS2101	Advanced Data Structures & Algorithm Analysis	PC	3	0	0	3
5	BT24CS2102	Object Oriented Programming Through Java	PC	3	0	0	3
6	BT24CS2103	Advanced Data Structures and Algorithm Analysis Lab	PC	0	0	3	1.5
7	BT24CS2104	Object Oriented Programming Through Java Lab	PC	0	0	3	1.5
8	BT24CS2105	Python Programming	PC	0	1	2	2
9	BT24BS2106	Environmental Science	MC	2	0	0	-
Total				**16**	**2**	**8**	**20**

B. Tech – II Year II Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24BS2204	Optimization Techniques	MC-I	2	0	0	2
2	BT24BS2202	Probability & Statistics	ES/BS	3	0	0	3
3	BT24CS2201	Operating Systems	PC	3	0	0	3
4	BT24CS2202	Database Management Systems	PC	3	0	0	3
5	BT24CS2203	Software Engineering	PC	3	0	0	3
6	BT24IT2201	Operating Systems & Software Engineering Lab	PC	0	0	3	1.5
7	BT24CS2205	Database Management Systems Lab	PC	0	0	3	1.5
8	BT24IT2202	Python with DJango	SEC	0	1	2	2
9	BT24HS2203	Design Thinking & Innovation	BS&H	1	0	2	2
Total				**15**	**1**	**10**	**21**
10	Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

N. Rama Krishnaiah
(Dr. N. RAMA KRISHNAIAH)
Professor & Head
Dept. of Computer Science & Engineering
UCEK, JNTUK, Kakinada, AP

Head of the Dept.
Department of IT
D.N.R. College of Engg. & Tech.

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24BS2105	L	T	P	C
		3	0	0	3

DISCRETE MATHEMATICS AND GRAPH THEORY

Course Objectives:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications.
- The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

Course Outcomes:

At the end of the course students will be able to

1. Build skills in solving mathematical problems (L3)
2. Comprehend mathematical principles and logic (L4)
3. Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software (L6)
4. Manipulate and analyze data numerically and/or graphically sing appropriate Software (L3)
5. How to communicate effectively mathematical ideas/results verbally or in writing (L1)

UNIT–I: Mathematical Logic:

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT-II: Set Theory:

Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

UNIT-III: Combinatorics and Recurrence Relations:

Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

Recurrence Relations:

Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

UNIT-IV: Graph Theory:

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs,

Unit-V: Multi Graphs

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby andSharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and GraphTheory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

(Dr. N. RAMA KRISHNAIAH)
Professor & Head
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UCEK, JNTUK, Kakinada, AP

Head of the Dept.
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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24HS2101	L	T	P	C
		2	1	0	3

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Course Objectives:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

1. Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
2. Identify one's self, and one's surroundings (family, society nature) (L1, L2)
3. Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
4. Relate human values with human relationship and human society. (L4)
5. Justify the need for universal human values and harmonious existence (L5)
6. Develop as socially and ecologically responsible engineers (L3, L6)

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I: Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: self-exploration as the Process for Value Education

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II: Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self

Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III: Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV: Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V: Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values ***Lecture 24:*** Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education PS1 Sharing about Oneself PS2 Exploring Human Consciousness PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being PS4 Exploring the difference of Needs of self and body.
PS5 Exploring Sources of Imagination in the self PS6 Exploring Harmony of self with the body
Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust.
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal
Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence
Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

1. The Textbook

R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1

2. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria,*Teachers' Manual for A Foundation Course in Human Values and Professional Ethics,* 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. *JeevanVidya: EkParichaya,* A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. *Human Values*, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth* - by Mohandas Karamchand Gandhi
5. *Small is Beautiful* - E. F Schumacher.
6. *Slow is Beautiful* - Cecile Andrews
7. *Economy of Permanence* - J C Kumarappa
8. *Bharat Mein Angreji Raj* – PanditSunderlal
9. *Rediscovering India* - by Dharampal
10. *Hind Swaraj or Indian Home Rule* - by Mohandas K. Gandhi
11. *India Wins Freedom* - Maulana Abdul Kalam Azad
12. *Vivekananda* - Romain Rolland (English)
13. *Gandhi* - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

in the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.
Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24EC2107	L	T	P	C
		3	0	0	3

DIGITAL LOGIC & COMPUTER ORGANIZATION

Course Objectives:

The main objectives of the course is to

- provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

UNIT – I:

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT – II:

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

UNIT – III:

Computer Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT – IV:

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT – V:

Input / Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

Textbooks:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

Reference Books:

1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson
2. Computer Organization and Design, David A. Paterson, John L.Hennessy, Elsevier
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson

Online Learning Resources:

1. https://nptel.ac.in/courses/106/103/106103068/

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24CS2101	L	T	P	C
		3	0	0	3

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

Course Objectives:

The main objectives of the course are to

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

UNIT – I:

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.

AVL Trees – Creation, Insertion, Deletion operations and Applications B-Trees – Creation, Insertion, Deletion operations and Applications

UNIT – II:

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT – III:

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT – IV:

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT – V:

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Textbooks:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2nd Edition Universities Press
2. Computer Algorithms in C++, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition University Press

Reference Books:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An Introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein&Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs:, N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. Abdul Bari Introduction to Algorithms (youtube.com)

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24CS2102	L	T	P	C
		3	0	0	3

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

The learning objectives of this course are to:

- identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- understand how to design applications with threads in Java
- understand how to use Java APIs for program development

UNIT I

Object Oriented Programming: Basic concepts, Principles,

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three- dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto- boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.
Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.
Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings,Comparison, Modifying, Searching; Class String Buffer.
Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.
Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface
Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma. Cambridge, 2023.
3) JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

1) The complete Reference Java, 11thedition, Herbert Schildt, TMH
2) Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24CS2103	L	T	P	C
		0	0	3	1.5

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB

Course Objectives:

The objectives of the course are to

- acquire practical skills in constructing and managing Data structures
- apply the popular algorithm design methods in problem-solving scenarios

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix b) Adjacency Lists
5. Write a program for finding the biconnected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job Sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

Online Learning Resources:

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24CS2104	L	T	P	C
		0	0	3	1.5

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Objectives:

The aim of this course is to

- Practice object oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

Experiments covering the Topics:

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, Java FX GUI

Sample Experiments:

Exercise – 1:

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program implement method overloading.

c) Write a JAVA program to implement constructor.

d)Write a JAVA program to implement constructor overloading.

Exercise - 4

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

c) Write a JAVA program for abstract class to find areas of different shapes

Exercise - 5

a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
c) Write a JAVA program that implements Runtime polymorphism

Exercise - 6

a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses
c) Write a JAVA program for creation of Java Built-in Exceptions
d) Write a JAVA program for creation of User Defined Exception

Exercise - 7

a) Write a JAVA program that creates threads by extending Thread class.First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds,(Repeat the same by implementing Runnable)
b) Write a program illustrating **is Alive** and **join ()**
c) Write a Program illustrating Daemon Threads.
d) Write a JAVA program Producer Consumer Problem

Exercise -- 8

a) Write a JAVA program that import and use the user defined packages
b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise -- 9

a) Write a java program that connects to a database using JDBC
b) Write a java program to connect to a database using JDBC and insert values into it.
c) Write a java program to connect to a database using JDBC and delete values from it

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24CS2105	L	T	P	C
		0	1	2	2

PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE)

Course Objectives:

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

UNTI-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operatorsiv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operatorsviii) Identity Operators

5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II:

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
   i. additionii. insertioniii. slicing
6. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

UNIT-IV:

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.

5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V:

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame
    b) Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - I Semester	Course Code: BT24BS2106	L	T	P	C
		2	0	0	-

ENVIRONMENTAL SCIENCE

Course Objectives:

To make the students to get awareness on environment

- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

Course Outcomes:

1. Grasp multidisciplinary nature of environmental studies and various renewable and non-renewable resources.
2. Understand flow and bio-geo-chemical cycles and ecological pyramids.
3. Understand various causes of pollution and solid waste management and related preventive measures.
4. About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
5. Casus of population explosion, value education and welfare programmes.

UNIT–I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems–Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies– Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. –Energy resources:

UNIT–II

Ecosystems: Concept to fan ecosystem. –Structure and function of an ecosystem–Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids–Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grass and ecosystem
c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation: Introduction Definition: genetic, species and ecosystem diversity–Bio-geographical classification of India–Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts– Endangered and endemic species of India –Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT–III

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and land- slides.

UNIT–IV

Social Issues and the Environment: From Unsustainable to Sustainable development–Urban problems related to energy – Water conservation, rain water harvesting, watershed management –Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions–Climate change, global warming, acid-rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wastel and reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act–Wild life Protection Act–Forest Conservation Act–Issues involved in enforcement of environment allegislation–Public awareness.

UNIT–V

Human Population and The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education–HIV/AIDS–Women and Child Welfare–Role of information Technology in Environment and human health–Case studies. Field Work: Visit to a local area to document environmental assets River/ forest grassland/ hill/ mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds–river, hills lopes, etc..

Text books:

1. Text book of Environmental Studies for Undergraduate Courses ErachBharucha for University Grants Commission, Universities Press.
2. Palani swamy, "Environmental Studies", Pearson education
3. S. Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K. Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus". Scitech Publications (India), Pvt. Ltd.

Reference Books:

1. Deeksha Dave and E. Sai Baba Reddy, "Text book of Environmental Science", Cengage Publications.
2. M. Anji Reddy, "Text book of Environmental Sciences and Technology", B S Publication.
3. J. P. Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private limited
5. G. R. Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24BS2204	L	T	P	C
		2	0	0	2

OPTIMIZATION TECHNIQUES

Pre-requisite:

Course Objectives:

- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
- To state transportation and assignment problem as a linear programming problem to determine Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.

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

1. State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
2. Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
3. Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
4. Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
5. Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

UNIT I: Introduction and Classical Optimization Techniques:

Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

UNIT II: Linear Programming:

Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm.

UNIT III: Transportation Problem:

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

UNIT IV: Nonlinear Programming:

Unconstrained cases. One – dimensional minimization methods: Classification, Fibonacci method, Univariate method, steepest descent method. Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method, Basic approaches of Interior and Exterior penalty function methods,

UNIT V: Dynamic Programming:

Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

Textbooks:

1. "Engineering optimization: Theory and practice", S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research", H.S. Kasene& K.D. Kumar, Springer (India), Pvt.LTd.

Reference Books:

1. "Optimization Methods in Operations Research and systems Analysis", by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr.S.D.Sharma, Kedarnath, Ramnath& Co

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24BS2202	L	T	P	C
		3	0	0	3

PROBABILITY & STATISTICS

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to

1. Classify the concepts of data science and its importance (L2)
2. Interpret the association of characteristics and through correlation and regression tools (L4)
3. Apply discrete and continuous probability distributions (L3)
4. Design the components of a classical hypothesis test (L6)
5. Infer the statistical inferential methods based on small and large sampling tests (L4)

Unit – I: Descriptive statistics and methods for data science:

Data science – Statistics Introduction – Population vs Sample –Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability – Skewness – Kurtosis.

UNIT – II: Correlation and Regression:

Correlation – Correlation coefficient – Rank correlation.

Linear Regression: Straight line – Multiple Linear Regression - Regression coefficients and properties – Curvilinear Regression: Parabola – Exponential – Power curves.

UNIT – III: Probability and Distributions:

Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory:

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Point and Interval estimations – Maximum error of estimate – Central limit theorem (without proof) – Estimation using t, χ^2 and F-distributions.

UNIT – V: Tests of Hypothesis:

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions –

Student's t- test, F-test, -χ^2 test.

Text Books:

1. **Miller and Freund's**, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. **S. C. Gupta and V.K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. **Jay I. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Sheldon M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. **Johannes Ledolter and Robert V. Hogg**, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24CS2201	L	T	P	C
		3	0	0	3
OPERATING SYSTEMS					

Course Objectives:

The main objectives of the course is to make student

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

UNIT - I

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT - II

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication.

Threads and Concurrency: Multithreading models, Thread libraries, Threading issues.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT – III

Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT - IV

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.

Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT - V

File System: File System Interface: File concept, Access methods, Directory Structure; File system **Implementation:** File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.

Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

Text Books:

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

Reference Books:

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw-Hill, 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html/

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24CS2202	L	T	P	C
		3	0	0	3

DATABASE MANAGEMENT SYSTEMS

Course Objectives:

The main objectives of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

UNIT I:

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT II:

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus.

BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III:

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion). Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view (updatable and non-updatable), relational set operations.

UNIT IV:

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd Normal Form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V:

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing:

Text Books:

1) Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2) Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

Reference Books:

1) Introduction to Database Systems, 8thedition, C J Date, Pearson.
2) Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24CS2203	L	T	P	C
		3	0	0	3

SOFTWARE ENGINEERING

Course Objectives:

The objectives of this course are to introduce

- Software life cycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

UNIT I:

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

UNIT II:

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT III:

Software Design: Overview of the design process, how to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT IV:

Coding and Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, Testing object-oriented programs, Smoke testing, and Some general issues associated with testing.

Software Reliability and Quality Management: Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000.SEI Capability maturity model. Few other important quality standards, and Six Sigma.

UNIT V:

Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

Software Reuse: reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

Text Books:

1. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A Practitioner's Approach, Roger S. Pressman, 9th Edition, Mc- Graw Hill International Edition.

Reference Books:

1. Software Engineering, Ian Sommerville,10th Edition, Pearson.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24IT2201	L	T	P	C
		0	0	3	1.5

OPERATING SYSTEMS & SOFTWARE ENGINEERING LAB

Course Objectives:

The main objectives of the course are to

- Provide insights into system calls, file systems, semaphores,
- Develop and debug CPU Scheduling algorithms, page replacement algorithms, thread implementation
- Implement Bankers Algorithms to Avoid the Dead Lock

Experiments covering the Topics:

- UNIX fundamentals, commands & system calls
- CPU Scheduling algorithms, thread processing
- IPC, semaphores, monitors, deadlocks
- Page replacement algorithms, file allocation strategies
- Memory allocation strategies

Sample Experiments:

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls fork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate UNIX commands like cp, ls, grep, etc.,
4. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c) Priority d) Round Robin
5. Control the number of ports opened by the operating system with
   a) Semaphore b) Monitors.
6. Write a program to illustrate concurrent execution of threads using pthreads library.
7. Write a program to solve producer-consumer problem using Semaphores.
8. Implement the following memory allocation methods for fixed partition
   a) First fit b) Worst fit c) Best fit
9. Simulate the following page replacement algorithms
   a) FIFO b) LRU c) LFU
10. Simulate Paging Technique of memory management.
11. Implement Bankers Algorithm for Dead Lock avoidance and prevention
12. Simulate the following file allocation strategies
    a) Sequential b) Indexed c) Linked
13. Download and install nachos operating system and experiment with it.

Sample Experiments in Software Engineering:

1) Perform the following, for the following experiments:
   i. Do the Requirement Analysis and Prepare SRS
   ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.
      a. Course Registration System
      b. Students Marks Analyzing System
      c. Online Ticket Reservation System
      d. Stock Maintenance
2) Consider any application, using COCOMO model, estimate the effort.
3) Consider any application, calculate effort using FP oriented estimation model.
4) Draw the UML Diagrams for the problem a, b, c, d.
5) Design the test cases for e-Commerce application (Flipcart, Amazon)
6) Design the test cases for a Mobile Application (Consider any example from Appstore)
7) Design and Implement ATM system through UML Diagrams.

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24CS2205	L	T	P	C
		0	0	3	1.5

DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Experiments covering the topics:

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

Sample Experiments:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
   i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non- indexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

Text Books/Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24IT2202	L	T	P	C
		0	1	2	2

PYTHON WITH DJANGO (SKILL ENHANCEMENT COURSE)

Course Objectives:

The main objectives of the course are to

- Design and build static as well as dynamic web pages and interactive web-based applications
- Web development using Django framework.
- Analyze and create functional website in Django and deploy Django Web Application on Cloud

UNIT-I : Python libraries for web development :

Collections-Container datatypes, Tkinter-GUI applications, Requests-HTTP requests, BeautifulSoup4-web scraping, Scrapy, Zappa, Dash, CherryPy, Turbo Gears, Flask, Web2Py, Bottle, Falcon, Cubic Web, Quixote, Pyramid.

Sample Experiments:

1. Write a Python GUI program to import Tkinter package and create a window. Set its title and add a label to the window.
2. Write a Python program that designs a simple login form with labels and Entry widgets, arranging them in a grid using the Grid geometry manager.
3. Write a program using BeautifulSoup4 library for web scraping for a given URL
4. Develop a sample Hello World page using Flask framework
5. Develop a sample web page using CherryPy / Web2Py / Bottle Framework

UNIT-II: Introduction to Django Framework

Understanding Django environment, Features of Django and Django architecture, MVC and MTV, Urls and Views, Mapping the views to URLs, Django Template, Template inheritance Django Models, Creating model for site, Converting the model into a table, Fields in Models, Integrating Bootstrap into Django, Creating tables, Creating grids, Creating carousels.

Sample Experiments:

1. Create a Sample "Hello World" Application using Django
2. Create a Login and Registration Page using MVC architecture in Django Framework
3. Create a sample page in Django by integrating BootStrap.
4. Create an application with Tables, grids in Django
5. Create a Django App with Carousels feature.

UNIT-III : Integrating Accounts & Authentication on Django

Introduction to Django Authentication System, Security Problem &Solution with Django Creating Registration Form using Django, Adding Email Field in Forms, Configuring email settings, Sending emails with Django, Adding Grid Layout On Registration Page, Adding Page Restrictions, Login Functionality Test and Logout.

Sample Experiments:

1. Create a registration page using Authentication System
2. Create an application in Django to send emails using email settings and Grid Layout
3. Create an application in Django using page restriction / authentication with Login and Logout Functionality
4. Create a sample form using Django Forms

UNIT-IV: Connecting SQLite with Django

Database Migrations, Fetch Data From Database, Displaying Data On Templates, Adding Condition On Data, Sending data from URL to view, Sending data from view to template, Saving objects into database, Sorting objects, Filtering objects, Deleting objects, Difference between session and cookie, Creating sessions and cookies in Django.

Sample Experiments:

1. Create an app in Django which fetches data from database and show as list and also save objects in database
2. Create an app in Django for performing CRUD operations on records in a database
3. Create an app in Django which uses session management and cookies to store and manage user sessions.

UNIT-V: Deploying Django Web Application on Cloud

Creating a functional website in Django, Four Important Pillars to Deploy, registering on Heroku and GitHub, Push project from Local System to GitHub, working with Django Heroku, Working with StaticRoot, Handling WSGI with gunicorn, setting up Database & adding users.

Sample Experiments:

1. Create a website in Django with login, and registration page.
2. Register on GitHub, and Heroku and deploy the website on Heroku with all the functionalities developed.
3. Configure Django to handle static files.

Text books:

1. Martin C.Brown, "Python: The Complete Reference Paper back", 4th Edition 2018, McGraw Hill Education.
2. Reema Thareja, "Python Programming: Using Problem Solving Approach", 3rd Edition 2017, Oxford.
3. Daniel Rubio, Apress, "Beginning Django Web Application Development and Deployment with Python", 2nd Edition 2017,Apress.

Reference Books:

1. Tom Aratyn, "Building Django 2.0 Web Applications: Create enterprise-grade, scalable Python web applications easily with Django 2.0",2ndEdition 2018, Packt Publishing.
2. Harry Percival, "Test-Driven Development with Python: Obey the Testing Goat: Using Django, Selenium and JavaScript",2nd Edition 2019, Kindle Edition.

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year - II Semester	Course Code: BT24ME2207	L	T	P	C
		1	0	2	2

DESIGN THINKING & INNOVATION

Course Objectives:

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

Course Outcomes:

Upon successful completion of this course, the student should be able to

1. Define the concepts related to design thinking (L2).
2. Explain the fundamentals of Design Thinking and innovation (L2).
3. Apply the design thinking techniques for solving problems in various sectors (L3)
4. Analyse to work in a multidisciplinary environment (L4).
5. Evaluate the value of creativity (L5)

UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

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H. T. No: | | | | | | | | | | | DR24 | Course Code: **BT24BS2105**

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-I Semester End Examinations (DR24)

DISCRETE MATHEMATICS AND GRAPH THEORY

(Common to CSE, AI&DS, CSE(AI&ML), & IT))

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
1	a	Is $\neg p \wedge (p \vee q)) \rightarrow q$ a tautology?	L2	CO1	2M
	b	Define DNF and CNF.	L2	CO1	2M
	c	Define partial order relation and give an example.	L2	CO2	2M
	d	Verify whether the following permutation is even or odd? 1 2 3 4 5 6 7 0 2 5 7 8 6 1 4 3	L2	CO2	2M
	e	How many 7 digit numbers can be formed using the digits 1,2,0,2, 4,2 and 4?	L2	CO3	2M
	f	Define Generating Function.	L2	CO3	2M
	g	Define complete graph and draw $K5$.	L2	CO4	2M
	h	Define connected graph and a disconnected graph.	L2	CO4	2M
	i	State Euler theorem.	L2	CO5	2M
	j	Define a spanning tree and give an example.	L2	CO5	2M

S. No.		PART – B (All Questions Carry Equal Marks)	50 Marks		
		UNIT – I	10 Marks		
2	a	Prove that (P→Q) ∧ (R→Q) and (PVR) →Q are equivalent.	L2	CO1	5M
	b	Find the Principal disjunctive normal form of PV(¬P∧¬Q∧R).	L2	CO1	5M
		OR			
3	a	Show that RVS follows logically from the premises C ∨ D, (C ∨ D) → ¬H, ¬H → (A ∧ ¬B) and (A ∧ ¬B) → R ∨ S.	L2	CO1	5M
	b	Symbolize the statement "ALL MEN ARE GAINTS" by quantifiers and predicate symbols.	L2	CO1	5M
		UNIT – II	10 Marks		
4	a	If A, B, C are three sets such that A⊆B. Show that (A × C) ⊆ (B × C).	L2	CO2	5M
	b	Find the transitive closure of the relation R={(1,2),(2,3),(3,3)} on the set {1,2,3}.	L2	CO2	5M
		OR			
5	a	Draw the Hasse diagram for the partial ordering {(A, B)/A is subset or equal to B} on the power set P(X) and given that X = {1, 2, 3}.	L2	CO2	5M
	b	Let the permutations of the elements {1, 2, 3, 4, 5} be given by	L2	CO2	5M

$$A = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 4 & 4 \end{pmatrix} \qquad B = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 5 & 4 \end{pmatrix}$$

AB and BA

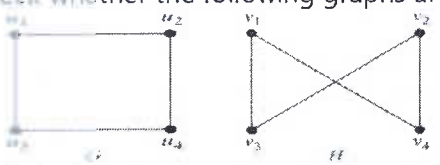
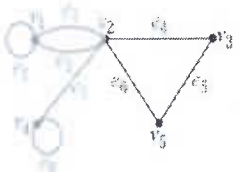
UNIT – III 10 Marks

6	a	How many permutations of the letters A, B, C, D, E, F, G and H contain the string CDE?	L2	CO3	5M
	b	Solve the recurrence relation $a_n+4a_{n-1}+4a_{n-2}=8$, $n\geq 2$ and given that $a_0 = 1$, $a_1 = 2$.	L2	CO3	5M

OR

7	a	A person invests Rs. 10,000 at the interest of 12% compounded annually. How much will be there at the end of 15 years.	L2	CO3	5M
	b	By using the generating function solve the recurrence relation $a_n - 2a_{n-1} - 3a_{n-2} = 0$, $n \geq 2$ and given that $a_0 = 3$, $a_1 = 1$.	L2	CO3	5M

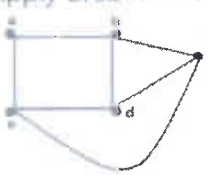
UNIT – IV 10 Marks

8	a	Check whether the following graphs are isomorphic or not. 	L2	CO4	5M
	b	Find the incidence matrix of the graph 	L2	CO4	5M

OR

9	a	Write about Euler and Hamiltonian graphs and give one example for each	L2	CO4	5M
	b	Define Graph? Explain in brief about Applications of graphs?	L2	CO4	5M

UNIT – IV 10 Marks

10	a	Apply breadth first search algorithm on the following figure 	L2	CO5	5M
	b	Define minimal spanning tree. Explain Krushal's Algorithm with example	L2	CO5	5M

OR

11	a	Define Planar graph and non-planar graph and also give one example for each.	L2	CO5	5M
	b	Find the chromatic number of the following graph 	L2	CO5	5M

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

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D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-I Semester End Examinations (DR24)

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

(Common to CE, ME, EEE, ECE, CSE, AI&DS, CSE(AI&ML), & IT)

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
		20 Marks			
1	a	Explain the process of value education	L2	CO1	2M
	b	Define the Human and Animal Consciousness	L2	CO1	2M
	c	How can we ensure harmony inself ('I')?	L2	CO2	2M
	d	What do you mean by Imagination?	L2	CO2	2M
	e	How is' trust' the foundation value of relationships	L2	CO3	2M
	f	Difference between reaction and response	L2	CO3	2M
	g	Define harmony in nature	L2	CO4	2M
	h	"As the seed, thus the plant ". Explain.	L2	CO4	2M
	i	What is ethical human conduct?	L2	CO5	2M
	j	Define the Holistic Alternative	L2	CO5	2M
S. No.		**PART – B (All Questions Carry Equal Marks)**		**50 Marks**	
		UNIT – I		10 Marks	
2	a	What are the basic guidelines for value education?	L2	CO1	5M
	b	Explain the process of self-exploration with a diagram	L2	CO1	5M
		OR			
3	a	Illustrate the purpose of self-exploration	L2	CO1	5M
	b	What is the difference between prosperity and wealth? What is more acceptable to us and why?	L2	CO1	5M
		UNIT – II		10 Marks	
4	a	Distinguish between the needs of the Self and the needs of the Body	L2	CO2	5M
	b	Explain the activities of knowing, assuming, recognizing and fulfillment with one examples	L2	CO2	5M
		OR			
5	a	Explain pre-conditioning and its effects at individual level.	L2	CO2	5M
	b	"I am the seer, do errand enjoyer. The body is my instrument"– Explain.	L2	CO2	5M
		UNIT – III		10 Marks	
6	a	What is meaning of justice in human relationships? How does it follow from family to world family?	L2	CO3	5M
	b	How can you maintain harmony in relationship?	L2	CO3	5M
		OR			
7	a	What are the programs needed to achieve the comprehensive human goal? List and define each briefly.	L2	CO3	5M

	b	Critically examine the state of society today in terms of fulfilment of comprehensive human goal.	L2	CO3	5M
		UNIT – IV	10 Marks		
8	a	What do you mean by 'in neatness'? What is the innateness in the four orders?	L2	CO4	5M
	b	Explain the differences and similarities between animal or der and human order. What is the relation between the two orders?	L2	CO4	5M
		OR			
9	a	How will you show interconnectedness and mutual fulfilment in four order of nature with examples.	L2	CO4	5M
	b	What do you mean by "conformance'? Explain the conformance in the four orders	L2	CO4	5M
		UNIT – IV	10 Marks		
10	a	What do you understand by definitiveness of ethical human conduct? Why is this definitiveness desirable?	L2	CO5	5M
	b	Give a critical review of the current management models in profession.	L2	CO5	5M
		OR			
11	a	What do you mean by competence in professional ethics? Elaborate with examples	L2	CO5	5M
	b	What do you understand by holistic technology? Briefly explain.	L2	CO5	5M

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

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D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-I Semester End Examinations (DR24)

DIGITAL LOGIC AND COMPUTER ORGANIZATION

Computer Science & Engineering / (Common to CSE, AI&DS, CSE(AI&ML), & IT)

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
1	a	Convert the following numbers with the given radix to decimal i) $(143)_8$ ii) $(1199)_{12}$	L2	CO1	2M
	b	Give truth table of XOR and NOR logic gates?	L2	CO1	2M
	c	Differentiate Combinational and Sequential Circuits?	L3	CO2	2M
	d	What is the functionality of a Business Computer System?	L2	CO2	2M
	e	What is an instruction Cycle?	L3	CO3	2M
	f	Give an example of signed addition and subtraction?	L3	CO3	2M
	g	What is memory hierarchy	L2	CO4	2M
	h	Define Cache Memory	L3	CO4	2M
	i	Explain the functionality of DMA?	L2	CO5	2M
	j	Define Interrupt and fie example?	L3	CO5	2M
		PART – B (All Questions Carry Equal Marks)	**50 Marks**		
		UNIT – I	10 Marks		
2	a	Convert the following numbers with the given radix to decimal i) $(21.95)_8$ ii) $(4433)_5$ iii) $(1199)_{12}$	L2	CO1	5M
	b	Minimize the given function F=∑ (1,2,3,5,7,9,11,13) use K-map method	L3	CO1	5M
		OR			
3	a	Design a 3 - bit full adder	L3	CO1	5M
	b	What is the significance of a multiplexer? Design a 4 * 1 multiplexer	L3	CO1	5M
		UNIT – II	10 Marks		
4	a	What is a shift register? Explain the modes of operations in a four-bit shift register?	L2	CO2	5M
	b	Design the truth table, characteristic able and excitation table of SR Flip Flop and JK Flip Flop	L2	CO2	5M
		OR			
5	a	Computer bus system. Discuss the basic computer instructions?	L3	CO2	5M
	b	Discuss Bus Memory Transfer with multiplexer	L3	CO2	5M
		UNIT – III	10 Marks		

6	a	Explain the flowchart of addition and subtraction of two binary numbers?	L3	CO3	5M
	b	Explain the flow chart of Multiplication and Division of two binary numbers	L3	CO3	5M
		OR			
7	a	What is instruction format? Discuss about the registers of basic computers.?	L3	CO3	5M
	b	Explain Micro-instruction format?	L2	CO3	5M
		UNIT – IV		10 Marks	
8	a	Discuss about the virtual memory?	L3	CO4	5M
	b	Explain main memory and auxiliary memory?	L3	CO4	5M
		OR			
9	a	Discuss the concept of Cache memory?	L2	CO4	5M
	b	Explain the significance of secondary memory devices?	L2	CO4	5M
		UNIT – IV		10 Marks	
10	a	With a neat diagram discuss the concept of Direct memory access?	L3	CO5	5M
	b	Discuss about parallel priority interrupt.?	L3	CO5	5M
		OR			
11	a	Differentiate between Memory Mapped I/O and Isolated I/O?	L2	CO5	5M
	b	Explain the Daisy Chaining priority with neat diagram?	L3	CO5	5M

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

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(AUTONOMOUS)

B. Tech. II-I Semester End Examinations (DR24)

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

(Common to CSE, IT, AI&DS & CSE(AI&ML))

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
		20 Marks			
1	a	What is an algorithm? Mention its properties	L3	CO1	2M
	b	What is height balanced tree? Give an example	L3	CO1	2M
	c	Give the properties of binomial heaps	L3	CO2	2M
	d	Write the abstract Divide and Conquer algorithm	L3	CO2	2M
	e	State the Job-Sequencing with Deadline Problem	L2	CO3	2M
	f	Define Minimum Cost Spanning Tree and list its applications	L2	CO3	2M
	g	Define sub set sum problem	L2	CO4	2M
	h	Explain briefly branch and bound technique for solving problems	L3	CO4	2M
	i	Compare P and NP problems	L3	CO5	2M
	j	What does NP-hard mean	L3	CO5	2M

S. No.		PART – B (All Questions Carry Equal Marks)			
		50 Marks			
		UNIT – I	10 Marks		
2	a	What do you mean by performance analysis? Give the algorithm for matrix multiplication and find the time complexity using step–count method ?	L2	CO1	5M
	b	Construct an AVL tree for the following numbers 14, 8, 12, 36, 23, 5, 67, 78, 20 ?	L3	CO2	5M
		OR			
3	a	Explain the rotations of AVL Tree with an example ?	L2	CO2	5M
	b	Explain the operations of B Tree with an example ?	L3	CO2	5M
		UNIT – II	10 Marks		
4	a	Illustrate the algorithm for deletion of an element from heap with an example ?	L2	CO2	5M
	b	Discuss the working strategy of merge sort and illustrate the process of merge sort algorithm for the given data: 43, 32, 22, 78, 63, 57, 91 and 13 ?	L3	CO3	5M
		OR			
5	a	Show step by step process for constructing binary heap using the following data 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13 and 2 ?	L4	CO2	5M
	b	Write an algorithm for quick sort based on divide-and-	L3	CO3	5M

		conquer strategy ?			
		UNIT – III		10 Marks	
6	a	Use the greedy algorithm for sequencing unit time jobs with deadlines and profits to generate the solution when n=7, ($p1$, $p2$, ... $p7$) = (3, 5, 20, 18, 1, 6, 30), and ($d1$, $d2$, ..., $d7$) = (1, 3, 4, 3, 2, 1, 2) ?	L3	CO3	5M
	b	Write and explain an algorithm to compute the all pairs shortest path using dynamic programming and prove that it is optimal ?	L2	CO3	5M
		OR			
7	a	What is a Spanning tree? Explain Prim's Minimum cost spanning tree algorithm with suitable example ?	L2	CO3	5M
	b	Discuss the time and space complexity of Dynamic Programming traveling sales person algorithm ?	L2	CO3	5M
		UNIT – IV		10 Marks	
8	a	Write control abstraction for backtracking ?	L2	CO4	5M
	b	Solve the following instanceof0/1 KNAPSACK problem using Dynamic Programming n=3, (W1,W2,W3)=(2,3,4), (P1,P2,P3)=(1,2,5), and m=6 ?	L3	CO4	5M
		OR			
9	a	What are the applications of graph coloring? Explain in detail ?	L2	CO4	5M
	b	Distinguish between back tracking and branch–and bound techniques ?	L2	CO4	5M
		UNIT – IV		10 Marks	
10	a	Differentiate between NP Hard and NP complete problems?	L2	CO5	5M
	b	Discuss in detail about Reducibility ?	L2	CO5	5M
		OR			
11	a	Explain cook's theorem ?	L2	CO5	5M
	b	What are the differences between Deterministic and Non-Deterministic algorithms ?	L2	CO5	5M

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

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H. T. No: | | | | | | | | | | | DR24 | Course Code: **BT24CS2102**

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-I Semester End Examinations (DR24)

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Common to CSE, IT, CSE(AI&ML), AI&DS)

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
		20 Marks			
1	a	Justify why java is both compile and interpreter program ?	L2	CO1	2M
	b	Discuss in detail about the statement "public static void main (String arg [])"?	L2	CO1	2M
	c	What is JVM ?	L2	CO2	2M
	d	What is method overloading ?	L2	CO2	2M
	e	Illustrate how to use this key word in a Java ?	L2	CO3	2M
	f	List out various unchecked exceptions ?	L2	CO3	2M
	g	What is the difference between final and finally?	L2	CO4	2M
	h	Explain about extends key word in Java ?	L2	CO4	2M
	i	Describe the different states of a thread ?	L2	CO5	2M
	j	Define JDBC ?	L2	CO5	2M
S. No.		**PART – B (All Questions Carry Equal Marks)**	**50 Marks**		
		UNIT – I	10 Marks		
2	a	"Java is portable and platform independent language"-give your justification ?	L2	CO1	5M
	b	Explain OOP Principles with an example ?	L2	CO1	5M
		OR			
3	a	Describe the structure of Java program with an example ?	L2	CO1	5M
	b	Explain in detail Buzz words of Java ?	L2	CO1	5M
		UNIT – II	10 Marks		
4	a	Explain the concepts of method overloading using suitable example ?	L2	CO2	5M
	b	Compare the pass-by-value with pass-by-reference method using an example ?	L2	CO2	5M
		OR			
5	a	Explain different types of constructors with example ?	L2	CO2	5M
	b	Explain different types of constructors with example ?	L2	CO2	5M
		UNIT – III	10 Marks		
6	a	Discuss the significance of Overriding Methods with a program ?	L3	CO3	5M
	b	With suitable code segments illustrate various uses of 'final' keyword ?	L3	CO3	5M
		OR			
7	a	Define interface? Explain how interfaces can be implemented in Java with an example program ?	L3	CO3	5M

	b	How to declare a multi-dimensional array in Java? Explain with an example ?	L2	CO3	5M
		UNIT – IV		10 Marks	
8	a	Explain Array List with an example program ?	L2	CO4	5M
	b	Build a java program to raise an Arithmetic Exception and handle it using try catch blocks ?	L3	CO4	5M
		OR			
9	a	Explain the steps involved in creating and working with user-defined packages with an example ?	L2	CO4	5M
	b	What is stream? Explain the types of streams and classes in java ?	L2	CO4	5M
		UNIT – IV		10 Marks	
10	a	Explain the synchronization of multiple threads in Java with an example ?	L3	CO5	5M
	b	Define String? Implement different methods available in string class ?	L3	CO5	5M
		OR			
11	a	Explain in detail JDBC Architecture ?	L3	CO5	5M
	b	Explain event delegation model in detail ?	L2	CO5	5M

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

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D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-II Semester End Examinations (DR24)

OPTIMIZATION TECHNIQUES

(Common to AI&ML & IT)

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
1	a	Define design vector ?	L2	CO1	2M
	b	Define objective function ?	L2	CO1	2M
	C	Define LPP ?	L2	CO2	2M
	d	Assumptions of Linear Programming ?	L2	CO2	2M
	e	Define Transportation Problem ?	L2	CO3	2M
	f	What are the types of Transportation Problem ?	L2	CO3	2M
	g	Define one dimensional minimization method ?	L2	CO4	2M
	h	Characteristics of a constrained problem ?	L2	CO4	2M
	i	Define dynamic programming ?	L2	CO5	2M
	j	Principles of optimality ?	L2	CO5	2M

S. No. **PART – B (All Questions Carry Equal Marks)** **50 Marks**

UNIT – I 10 Marks

2 Explain single variable and multi-variable optimization? L2 CO1 10M

OR

3 Determine the maximum and minimum values of the function $f(x)=12x^5-45x^4+40x^3+5$? L3 CO1 10M

UNIT – II 10 Marks

4 Explain pivotal reduction of a general system of equations ? L2 CO2 10M

OR

5 Solve the following LPP using simplex method
Maximize $Z=12x_1+16x_2$
STC $10x_1+20x_2 <= 120$
$8x_1+8x_2 <= 80$ L4 CO2 10M

UNIT – III 10 Marks

6 Explain the types of Transportation Problems? L2 CO3 10M

OR

7 Find the initial basic feasible solution using North West corner cell method? L3 CO3 10M

	A	B	C	D	Supply
A	3	1	7	4	250
B	2	6	5	9	350
C	8	3	3	2	400
Demand	200	300	350	150	

	UNIT – IV			10 Marks
8	Explain the basic approaches of Interior penalty function method ?	L2	CO4	10M
	OR			
9	Find the Optimize $Z=4x_1^2+2x_2^2+x_3^2-4x_1x_2$ Subject to $x_1+x_2+x_3=15$ $2x_1-x_2+2x_3=20$	L2	CO4	10M
	UNIT – IV			10 Marks
10	Explain dynamic programming multistage decision process?	L2	CO5	10M
	OR			
11	Explain the features and methods of dynamic programming?	L2	CO5	10M

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

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D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-II Semester End Examinations (DR24)

PROBABILITY AND STATISTICS

(CSE, AI&DS, CSE(AI&ML), & IT)

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
1	a	Define Quantitative and Qualitative Data with example?	L2	CO1	2M
	b	Find mean, mode, median of 55, 60, 60, 63, 63, 63, 63, 65, 65	L3	CO1	2M
	c	Define Discrete and continuous R and om variables	L2	CO2	2M
	d	The mean of Binomial distribution is 20 and standard deviation is 4. Find the parameters of the distribution	L3	CO2	2M
	e	What is the sampling distribution of the sample mean, and how does it relate to the Central Limit Theorem?	L2	CO3	2M
	f	Define types of estimations with examples	L3	CO3	2M
	g	Define Null and Alternative Hypothesis and types of errors	L3	CO4	2M
	h	How large as ample be needed to assert with the assumptions maximum Error is 10hours,σ=48 hours, $Z\alpha/2$ =1.645	L3	CO4	2M
	i	Define types of correlations	L3	CO5	2M
	j	Explain the method of least square for fitting a straight-line	L3	CO5	2M

S. No.		PART – B (All Questions Carry Equal Marks)			50 Marks
		UNIT – I			10 Marks
2	a	Explain Datatypes and the methods of data collection	L2	CO1	5M
	b	The weights of 50 college students are given in the following table. Find the mode of the distribution ?	L3	CO1	5M

Weight (Kg)	60–64	65–69	70–74	75–79	80–84
No of Students	5	9	16	12	8

OR

3	a	What is Grouped and Ungrouped frequency distribution and their Uses	L2	CO1	5M
	b	Find the variance of the following frequency distribution	L3	CO1	5M

Class	0-10	10-20	20-30	30-40	40-50
Freq.	5	10	20	5	10

		UNIT – II			10 Marks
4	a	In a bolt factory machines A, B, C manufactures 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be	L3	CO2	5M

		defective. Find the probability that it is manufactured by Machine A.				
	b	Given f(x)=k/2x, is a probability distribution for a random variable X can take on the values x=1,2,3 and 4. Find i) k ii) Mean iii)Variance.	L3	CO2	5M
		OR			
5	a	20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random i) none is defective ii)one is defective (iii) at most 2 defective	L3	CO2	5M
	b	If X is a Normal variate with Mean 30 and Standard deviation 5. Find i)) $P(26 \leq X \leq 40)$ ii)) $P(X \geq 45)$	L3	CO2	5M
		UNIT – III		10 Marks	
6	a	Find the Mean and Standard deviation of sampling distribution of means for the population 2,3,4,5 by drawing samples of size two with replacement.	L3	CO3	5M
	b	What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence	L3	CO3	5M
		OR			
7	a	The mean weekly wages of workers are with standard deviation of rupees 4. A sample of 625 is selected. Find the standard error of the mean	L3	CO3	5M
	b	If a random sample of size 81 was taken whose variance is 20.25 and mean is 32 from a population, construct 98% confidence interval for population mean.	L3	CO3	5M
		UNIT – IV		10 Marks	
8	a	In a college of 600 students of a certain college 400 are found to use ball pens. In another college of 900 students, 450 were found to use ball pens. Test whether the two colleges are significantly different with respect to the habit of using ball pens.	L3	CO4	5M
	b	To compare two kinds of bumper guards, 6 of each kind were mounted on a car and then the car was run into a concrete wall. The following are the costs of repairs. Use the 0.01 level of significance to test whether the difference between two sample means is significant.	L3	CO4	5M

Guard1	107	148	123	165	102	119
Guard2	134	115	112	151	133	129

OR

9	a	Sample of students were drawn from two universities and from their weights and standard deviations are calculated. Make a large sample test to test the significance of the difference between the means. (Useα=0.05).	L3	CO4	5M

	Mean	S.D	Size of the sample
University A	55	10	400
University B	57	15	100

	b	The average losses of workers, before and after certain program are given. Use 0.05 level of significance to test whether the program is effective (paired sample t -test)							L3	CO4	5M
		Before	10	70	45	120	35	55	77		
		After	35	65	42	116	33	50	73		
		UNIT – IV								10 Marks	
10	a	Fit a curve of the form by the method of least squares approximations to the following data							L3	CO5	5M
		X	1	2	3	4	5	6			
		Y	151	100	61	50	20	8			
	b	Calculate correlation co-efficient and hence find regression lines of X on Y and Yon X for the following data							L3	CO5	5M
		X	2	4	6	8	10	12	14		
		Y	4	2	5	10	4	11	12		
		OR									
11	a	Find the rank correlation co-efficient between x and y from the following data							L3	CO5	5M
		x	55	56	58	59	60	60	62		
		y	35	38	38	39	44	43	45		
	b	Explain the concept of curvi-linear (polynomial) regression with examples							L3	CO5	5M

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D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-II Semester End Examinations (DR24)

OPERATING SYSTEMS

(Common to CSE & IT)

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
					20 Marks
1	a	What is an operating system? Give an Example	L2	CO1	2M
	b	Describe the operating system functions?	L2	CO1	2M
	c	List out any four system calls in OS?	L2	CO2	2M
	d	Explain about state process model in OS	L2	CO2	2M
	e	Explain different types of schedulers?	L2	CO3	2M
	f	Distinguish between Segmentation and paging	L2	CO3	2M
	g	Name the various Page replacement algorithms?	L2	CO4	2M
	h	Define a file and List the various File Attributes	L2	CO4	2M
	i	List the various Disk-Scheduling Algorithms	L2	CO5	2M
	j	What are goals of system protection?	L2	CO5	2M

S. No.		PART – B (All Questions Carry Equal Marks)			50 Marks
		UNIT – I			10 Marks
2	a	Explain the various objectives and functions of Operating systems?	L2	CO1	5M
	b	What are different types of operating system? Explain them in detail	L2	CO1	5M
		OR			
3	a	Explain structure of operating system with a neat diagram	L2	CO1	5M
	b	Explain in detail about the types of system calls in OS?	L2	CO1	5M
		UNIT – II			10 Marks
4	a	Draw and explain five state process model	L2	CO2	5M
	b	Explain about various CPU scheduling criteria in OS	L2	CO2	5M
		OR			
5	a	Explain Round Robin scheduling algorithm with example	L2	CO2	5M
	b	Explain about Readers and writers Problem with an example	L2	CO2	5M
		UNIT – III			10 Marks
6	a	Explain about first fit, best fit, worst fit, next fit algorithms?	L2	CO3	5M
	b	Distinguish between the paging and segmentation?	L2	CO3	5M
		OR			
7	a	Explain the LRU and Optimal page replacement algorithms	L2	CO3	5M
	b	What is thrashing and explain the methods to avoid thrashing?	L2	CO3	5M
		UNIT – IV			10 Marks
8	a	Explain about necessary conditions of deadlock	L2	CO4	5M
	b	Explain dead lock Avoidance in detail	L2	CO4	5M

		OR			
9	a	Explain about single-level, two-level directory structure?	L2	CO4	5M
	b	Briefly discuss various Disk-scheduling algorithms.	L2	CO4	5M
		UNIT – IV		10 Marks	
10	a	Explain goals and principles of system protection in detail.?	L2	CO5	5M
	b	Discuss about the system and network threats in OS?	L2	CO5	5M
		OR			
11	a	What are the features of firewall? How firewall protects the system?	L2	CO5	5M
	b	Summarize Computer security classification?	L2	CO5	5M

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

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D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-II Semester End Examinations (DR24)

DATABASE MANAGEMENT SYSTEMS

(Common to CSE & IT)

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
1	a	Define a database system and mention its key characteristics ?	L2	CO1	2M
	b	What is data independence in DBMS?	L2	CO1	2M
	c	List the different types of integrity constraints in the relational model ?	L2	CO2	2M
	d	What is the difference between a domain and an attribute in the relational model ?	L2	CO2	2M
	e	What is the purpose of the WHERE clause in SQL queries?	L2	CO3	2M
	f	Explain nested query in SQL?	L2	CO3	2M
	g	Explain the concept of loss less join decomposition ?	L2	CO4	2M
	h	What is a multivalued dependency in database design?	L2	CO4	2M
	i	List the different states of a transaction ?	L2	CO5	2M
	j	Define dead lock in the context of databases ?	L2	CO5	2M

S. No.		PART – B (All Questions Carry Equal Marks)			50 Marks
		UNIT – I			10 Marks
2	a	Differentiate database systems and file systems in terms of data integrity, security, and redundancy, with suitable examples ?	L3	CO1	5M
	b	Explain different data models with examples and discuss their relevance in modern database systems ?	L2	CO1	5M
		OR			
3	a	Illustrate different types of attributes with examples for each one ?	L2	CO1	5M
	b	Explain the concepts of specialization and generalization in ER modeling and analyze their impact on database design ?	L2	CO1	5M
		UNIT – II			10 Marks
4	a	Write SQL commands to create, alter, and modify a table schema for a student database and analyze their impact ?	L3	CO2	5M
	b	Explain various types of constraints in a relational model with examples and discuss their importance in ensuring data consistency ?	L2	CO2	5M
		OR			
5	a	Explain different types of constraints in SQL with suitable example for each one ?	L2	CO2	5M
	b	Illustrate the importance of NULL values in relational databases and demonstrate scenarios where they are useful	L3	CO2	5M

		or problematic ?			
		UNIT – III		10 Marks	
6	a	Illustrate nested queries and sub queries with examples highlighting their use cases ?	L3	CO3	5M
	b	Explain the use of GROUP BY and HAVING clauses in SQL for data aggregation, and analyze the impact on query performance ?	L2	CO3	5M
		OR			
7	a	Identify and explain different types of joins and explain the results with suitable examples ?	L2	CO3	5M
	b	Explain nested queries and subqueries with examples highlighting their use cases ?	L3	CO3	5M
		UNIT – IV		10 Marks	
8	a	Illustrate different types of normal forms explain with suitable example for each type ?	L2	CO4	5M
	b	Apply the concept of functional dependencies to determine the highest normal form of a given relation ?	L3	CO4	5M
		OR			
9	a	Discuss the trade-offs between normalization and de-normalization in real-world database applications ?	L2	CO4	5M
	b	Apply the concept of surrogate keys to resolve data anomalies in schema design with an example ?	L3	CO4	5M
		UNIT – IV		10 Marks	
10	a	Demonstrate with an example how a transaction progresses through different states and ensure ACID properties are maintained ?	L3	CO5	5M
	b	Interpret various concurrency control techniques and compare their effectiveness in handling simultaneous transactions ?	L3	CO5	5M
		OR			
11	a	Explain impact of using B+ tree indexing in query optimization with practical scenarios ?	L3	CO5	5M
	b	Explain the recovery process in databases by analyzing different recovery algorithms such as log-based and shadow paging ?	L3	CO5	5M

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D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

B. Tech. II-II Semester End Examinations (DR24)

SOFTWARE ENGINEERING

(Common to CSE & IT)

Time: 3 hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	BTL	CO	M
		20 Marks			
1	a	What does the term "Agile development" refer to in the context of software development?	L2	CO1	2M
	b	What is the Waterfall model in software development?	L2	CO1	2M
	c	What is the purpose of a Software Requirements Specification (SRS) in software development?	L2	CO2	2M
	d	Illustrate the axiomatic specification in the context of software engineering?	L2	CO2	2M
	e	Explain the purpose of cohesion in software design?	L2	CO3	2M
	f	List how coupling refer to in software design?	L2	CO3	2M
	g	Compare Black Box Testing with White Box Testing?	L2	CO4	2M
	h	Explain about smoke testing in software testing?	L2	CO4	2M
	i	Describe the primary purpose of CASE tools in the software development life cycle?	L2	CO5	2M
	j	Define the term "second generation CASE tools"?	L2	CO5	2M

S. No.		PART – B (All Questions Carry Equal Marks)			50 Marks
		UNIT – I			10 Marks
2	a	Describe the key differences between exploratory-style software development and traditional software development approaches.	L2	CO1	5M
	b	Explain the main characteristics of the Agile development model and how it differs from the Waterfall model	L2	CO1	5M
		OR			
3	a	Illustrate how the Spiral Model integrates risk analysis in to the software development process. Provide an example of a project scenario where this model would be beneficial	L2	CO1	5M
	b	Apply the concept of the Software Development Life Cycle (SDLC)to outline a step-by-step process for developing a small e-commerce website	L2	CO1	5M
		UNIT – II			10 Marks
4	a	Explain the importance of a Software Requirements Specification (SRS) document in the software development process.	L2	CO2	5M
	b	Describe the differences between formal system specification and executable specification techniques	L2	CO2	5M

		OR			
5	a	Given an example of a library management system, outline the steps involved in requirements gathering and analysis	L2	CO2	5M
	b	Apply the concept of algebraic specification to define a simple stack data structure. Include its operations such as push, pop, and is Empty.	L2	CO2	5M
		UNIT – III		10 Marks	
6	a	Explain the key differences between cohesion and coupling in software design. Why is high cohesion and low coupling desirable?	L2	CO3	5M
	b	Describe the role of Data Flow Diagrams (DFDs) in the Structured Analysis (SA/SD) methodology.	L2	CO3	5M
		OR			
7	a	Given a simple e-commerce application, create a layered design with appropriate modules and justify your choice of layering.	L2	CO3	5M
	b	Apply the principles of user interface design to propose an interface layout for a mobile banking application. Highlight features that ensure usability and user satisfaction	L2	CO3	5M
		UNIT – IV		10 Marks	
8	a	Explain the difference between Black Box Testing and White Box Testing, and provide examples of when each is used.	L2	CO4	5M
	b	Describe the purpose and significance of smoke testing in the software testing process.	L2	CO4	5M
		OR			
9	a	What is the SEI Capability Maturity Model (CMM), and how does it help improve software quality?	L2	CO4	5M
	b	Define software reliability and explain how statistical testing can be used to measure it.	L2	CO4	5M
		UNIT – IV		10 Marks	
10	a	Explain the scope of CASE tools and how they support the software development life cycle.	L2	CO5	5M
	b	Describe the characteristics of CASE tools and how they contribute to improving the efficiency of software development.	L2	CO5	5M
		OR			
11	a	What is software reverse engineering, and how is it beneficial in the software maintenance process?	L2	CO5	5M
	b	Discuss the various software maintenance process models and how they aid in estimating maintenance costs.	L2	CO5	5M

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

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ANNEXURE - H

D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)
BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202
Ph: 08816-221238, Email: *dnrcet@gmail.com* , ***Website:*** *https://dnrcet.org*

Accredited with A^{++} Grade with 3.73/4 CGPA by NAAC and Accredited by NBA (B. Tech- CSE, ECE & EEE)

Department of Information Technology

Course Content for Certificate Course

For I Year I Semester

Course Name	**Computer System Fundamentals**	Duration	**8 Weeks**
Course Type	**Core**	Category	**CSE**
Credit Points	**4**	Level	**Undergraduate**

Course Structure:

Week 1: Introduction to Computer Systems

Week 2: Storage Organization

Week 3: Software and Hardware

Week 4: Fundamental of Operating System

Week 5: Introduction to DBMS

Week 6: Fundamentals of Data Communication

Week 7: Introduction to Communication Devices

Week 8: Information Security Concerns

Chairperson Board of Studies / Head of the Department

Head of the Dept.
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Course Content for Certificate Course

For I Year II Semester

Course Name	**Introduction to Artificial Intellegence**	Duration	**12 Weeks**
Course Type	**Core**	Category	**CSE**
Credit Points	**4**	Level	**Undergraduate**

Course Structure:

Week 1: Introduction: Philosophy of AI, Definitions
Week 2: Modeling a Problem as Search Problem, Uninformed Search
Week 3: Heuristic Search, Domain Relaxations
Week 4: Local Search, Genetic Algorithms
Week 5: Adversarial Search
Week 6: Constraint Satisfaction
Week 7: Propositional Logic & Satisfiability
Week 8: Uncertainty in AI, Bayesian Networks
Week 9: Bayesian Networks Learning & Inference, Decision Theory
Week 10: Markov Decision Processes
Week 11: Reinforcement Learning
Week 12: Introduction to Deep Learning & Deep RL

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Course Content for Certificate Course

For II Year I Semester

Course Name	**Python Programming Using Django**	Duration	**14 Weeks**
Course Type	**Core**	Category	**CSE**
Credit Points	**4**	Level	**Undergraduate**

Course Structure:

Week 1: INTRODUCTION TO FRONT END

Html, CSS, JavaScript, Bootstrap.

Week 2: INTRODUCTION TO DJANGO

Features of Django, Django web server, Understanding Django environment, A simple 'Hello world' application.

Week 3: DISPLAYING HYPERLINKS - PROJECT

Django architecture, MVC and MTV, starting a project, Django apps, activating our first app, A view that displays a hyperlink, Mapping the views to URLs, Running our first app, Improving the views using templates, The improved templates, Template inheritance, Sending data from URL to view, Sending data from view to template

Week 4: CREATING A WEBSITE - PROJECT

Starting a project, creating an app inside the project, Activating the app, creating model for our site, Converting the model into a table, Examples for Fields in Models, Basic data access using Django shell, saving objects into database, retrieving objects from database, modifying objects of database, Sorting objects, Filtering objects, Deleting objects, Making changes in the data model

Week 5: CREATING ADMINISTRATION PANEL

Using the admin interface, Customizing the admin interface, adding users, Data access and modification using admin panel, Giving permissions to users.

Week 6: CREATING FIRST PAGE OF OUR SITE

The Django template system, Template Inheritance, Improving the website, adding background color for web pages, adding banner to the web site, adding background image in the web pages, Storing and displaying images, Adding users to our site, Uploading the information by user, Changing the administration interface title.

Week 7: DJANGO FORMS CREATION

Forms basics, Creating Contact Us form, Form field examples

Week 8: DJANGO's EMAIL FUNCTIONALITY
Configuring email settings, Sending emails with Django

Week 9: DJANGO TEMPLATE LANGUAGE
Django template tags, If/else, If/elif/else, For, Comments, Filters, using templates to display data in the site

Week 10: INTEGRATING BOOTSTRAP INTO DJANGO
Introduction to Bootstrap, creating tables, creating grids, Creating carousels

Week 11: SESSIONS AND COOKIES
Difference between session and cookie, Creating sessions and cookies in Django.

Week 12: USING OTHER DATABASES IN DJANGO
Using SQLite, Configuring MySQL database, Working with MySQL in Django
Configuring Oracle database, Working with Oracle in Django

Week 13: DJANGO RESTful API
CRUD operations

Week 14: LIVE PROJECT IMPLEMENTATION
Project life cycle

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Course Content for Certificate Course

For II Year II Semester

Course Name	**Data Science for Engineers**	Duration	**8 Weeks**
Course Type	**Core**	Category	**CSE**
Credit Points	**4**	Level	**Undergraduate**

Course Structure:

Week 1: Course Philosophy and introduction to R

Week 2: Linear algebra for data Science

i) Algebraic view – vectors, matrices, products of matrix & vectors, rank, null space, solution of over-determined set of equations and pseudo-inverse)

ii) Geometric view-vectors, distance, projections, eigenvalue decomposition

Week 3: Statistics (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)

Week 4: Optimization

Week 5: 1. Optimization

2. Topology of data science problems and a solution framework

Week 6: 1. Simple linear regression and verifying assumptions used in linear regression.

2. Multivariate linear regression model assessment, assessing importance of different variable, subset selection.

Week 7: Classification using logistic regression.

Week 8: Classification using KNN and k-means clustering

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DR24

ENGINEERING CURRICULUM

(Applicable for batches admitted from 2024-2025)

B.Tech. REGULAR/ HONORS

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B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year **2024-25** onwards)

&

B.Tech.(Lateral Entry Scheme)

(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year **2025 - 26** onwards)

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY(Autonomous)
BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

Academic Regulations (DR24) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year **2024-25** onwards)

DNR College of Engineering & Technology 2024 Regulations (DR24 Regulations) applicable to all programmes given hereunder. These regulations govern the B. Tech. programmes offered by all the Departments with effect from the students admitted into the programmes from academic year 2024-25.

1. Courses of Study

The following programmes of study are offered at present as specializations for the B. Tech. programmes in DNR College of Engineering & Technology, Bhimavaram.

S. No.	Programme	Code	Short Name
1	Civil Engineering	01	CE
2	Electrical & Electronics Engineering	02	EEE
3	Mechanical Engineering	03	ME
4	Electronics & Communication Engineering	04	ECE
5	Computer Science & Engineering	05	CSE
6	Information Technology	12	IT
7	Artificial Intelligence and Data Science	54	B.Tech-AIDS
8	Artificial Intelligence and Machine Learning	42	CSE(AIML)

2. Award of the Degree

a. **Award of the B.Tech. Degree / B.Tech. Degree** with a Minor if he/she fulfills the following:
   i. Pursues a Programme of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
   ii. Registers for 160 credits and secures all 160 credits.

b. **Award of B.Tech. degree with Honors:** A student will be declared eligible for the award of the B.Tech with Honors if he/she fulfills the following:
   i. Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.
   ii. Registering for Honors is optional.
   iii. Honors is to be completed simultaneously with B.Tech. programme.

3. Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 2 a) i).

4. Admissions

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/JNTUK University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

5. Program related terms

Credit: A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

Credit Definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

a. ***Academic Year:*** Two consecutive (one odd + one even) semesters constitute one academic year.
b. ***Choice-Based Credit System (CBCS):*** The CBCS provides a choice for students to select from the prescribed courses.

6. Semester/Credits:

a. A semester comprises 90 working days and an academic year is divided into two semesters.

b. The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.

c. Regular courses may also be offered during the summer on a fast-track mode to enable students to do additional courses or complete backlogs in a course work.

d. The college can decide on the courses to be offered in the summer term depending on the availability of the faculty and the number of students.

7. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B. Tech) are broadly classified as follows

S. No	Category	Breakup of Credits (Total 160)	Percentage of total Credits	AICTE Recommendations (%)
1	Humanities and Social Science including Management (HM)	13	8%	8 – 9 %
2	Basic Sciences (BS)	20	13%	12 – 16%
3	Engineering Sciences (ES)	23.5	14%	10 – 18%
4	Professional Core (PC)	54.5	34%	30 – 36%
5	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21%	19 – 23%
6	Internships & Project work (PR)	16	10%	8 – 11%
7	Mandatory Courses (MC)	Non-Credit	Non-Credit	

8. Course Classification:

All subjects/ courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Core Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes courses related to the parent discipline/department/branch of Engineering
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective courses related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective courses which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	Interdisciplinary/job-oriented/domain courses which are relevant to the industry
4.	Project & Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering courses of developing desired attitude among the learners

9. Programme Pattern

i. Total duration of the of B. Tech (Regular) Programme is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. Minimum number of instruction days in each semester is 90 days.
iv. There shall be mandatory student induction program for freshers, with a three- week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.

v. Health/wellness/yoga/sports and NSS /NCC /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.
vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
vii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.
viii. Increased flexibility for students through an increase in the elective component of the curriculum. with 05 Professional Elective courses and 04 Open Elective courses.
ix. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.
x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.
xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.
xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.
xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.
xiv. There shall also be mandatory full internship in the final semester of the programme along with the project work.
xv. Undergraduate degree with Honors is introduced by the College for the students having good academic record.
xvi. The College shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
xvii. Each Department shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/other competitive exams etc.
xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

10. Evaluation Process

The performance of a student in each semester shall be evaluated course wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship & Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated internally for 30 marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and semester end examination marks taken together for the theory, practical, design, drawing subject or project etc. In case of a mandatory course, he/she should secure 40% of the total marks.

Theory Courses:

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

i. For theory and practical courses, the distribution shall be 30 marks for continuous Internal Evaluation and 70 marks for the Semester End-Examination.
ii. If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and semester end examination question paper shall be set with two parts each for 35 marks.
iii. If any course is having both theory and practical components, they will be evaluated separately as theory course and practical course. However, they will be given same course code with an extension of 'T' for theory subject and 'P' for practical subject.

a) Continuous Internal Evaluation

i. For theory courses, during the semester, there shall be two internal examinations. Each internal examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
ii. Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 5 marks.
iii. Note:
- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted on the day of subjective paper test.
- Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iv. If the student is absent for the internal examination, no re-exam shall be conducted and internal marks for that examination shall be considered as zero.
v. The first internal examination shall be conducted for I, II and half of the III unit syllabus with one either or type question from each unit. The second internal examination shall be conducted for remaining half of the syllabus from III unit, IV and V units with one either or type question from each unit
vi. Final internal marks shall be arrived at by considering the marks secured by the student in both the internal examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first internal : 25
Marks obtained in second internal : 20
Final internal Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one internal examination, the final internal marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

For Example:

Marks obtained in first internal : Absent
Marks obtained in second internal : 25
Final internal Marks: (25x0.8) + (0x0.2) =20

b) End Examination Evaluation:

End examination of theory courses shall have the following pattern:

i. Part-A shall contain 10 compulsory short answer questions for a total of 20marks such that each question carries 2 marks.
ii. There shall be 2 short answer questions from each unit.
iii. In each of the questions in Part-B, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
iv. The questions from 2 to 11 in part-B shall be set by covering one unit of the syllabus for each question either/or type.

End examination of theory courses consisting of two parts of different courses, ***for Example:*** Basic Electrical & Electronics Engineering shall have the following pattern:

i. Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
ii. Part-A shall contain 10 compulsory short answer questions for a total of 10 marks such that each question carries 1mark.
iii. Part-B contains Six either/or type questions of 10 marks each. Students shall answer any one of them.
iv. All the questions in Part-B shall be set by covering one unit of the syllabus for each question.

Practical Courses:

Assessment Method	Marks
Continuous Internal Assessment	**30**
Semester End Examination	70
Total	**100**

a) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.

b) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.

c) The end examination shall be evaluated for 70 marks, conducted by the concerned

laboratory teacher and a senior expert in the subject from the same department.

- Procedure: 20 marks
- Experimental work & Results: 30 marks
- Viva voce: 20 marks.

In a practical course consisting of two parts (Eg: Basic Electrical &Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Internal examination shall be evaluated for 30 marks in each part and final internal marks shall be arrived by considering the average of marks obtained in two parts.

d) For the course having design and/or drawing, such as Engineering Drawing/Graphics, the distribution of marks shall be 30 for continuous evaluation and 70 for semester end examination.

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two internal examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better internal exam marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in internal examination. The sum of day-to-day evaluation and the internal exam marks will be the final internal marks for the course.

The end examination pattern for Engineering Drawing/Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other courses related to design/drawing, multiple branches, etc. is mentioned along with the syllabus.

e) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

f) The laboratory records and internal exam test papers shall be preserved for a minimum of 3 years in the respective Departments as per the College/University norms and shall be produced to the Committees of the College/University as and when the same are asked for.

11. Skill oriented Courses

a) There shall be five skill-oriented courses offered during III to VII semesters.

b) Out of the five skill courses two shall be skill-oriented courses from the same domain

of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.

c) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 internal marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the Controller of Examinations/Principal.

d) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.

e) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the Department/ College to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

f) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the College at the beginning of the semester.

g) If a student prefers to take a certificate course offered by external agency, the concerned department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the College.

12. Massive Open Online Courses (MOOCs):

A Student has to pursue and complete one course compulsorily through MOOCs approved by the Institution. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted

by the university.
Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

13. Credit Transfer Policy

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the Institution shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

i) The College shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.
iv) The concerned department shall identify the courses permitted for credit transfer.
v) The Institution/Department shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
vi) The institution/Department shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii) The Institution shall ensure no overlap of MOOC exams with that of the semester end examinations. In case of delay in results, the university will re-issue the marks sheet for such students.
viii) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
ix) The concerned Departments shall submit the following to the examination section of the Institution:
    a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
    b) Undertaking form filled by the students for credit transfer.
x) The Institution shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the Department/Institution from time to time.

14. Academic Bank of Credits (ABC)

The Institution has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i) provide option of mobility for learners across the universities of their choice
ii) provide option to gain the credits through MOOCs from approved digital platforms.
iii) facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
iv) execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

15. Mandatory Internships

Summer Internships: Two summer internships either onsite or virtual each with a minimum of 08 weeks' duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / Institution shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the Institution.

Full Semester Internship and Project work: In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the Institution and is evaluated for 140 marks.

The concerned Department shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

16. Guidelines for offering a Minor

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

i) The Minor program requires the completion of 12 credits in Minor stream chosen.

ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.
iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor by opting for the courses offered through various verticals/tracks under Open Electives.

17. Guidelines for offering Honors

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally, the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
ii) A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).
iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.
iv) The concerned HOD shall arrange separate class work and timetable of the courses offered under Honors program.
v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
vi) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks' duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.
vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
ix) **A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors** degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.
x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors:

i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline
ii) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.
iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
v) Honors is to be completed simultaneously with a Major degree program.

Registration for Honors:

i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
iv) There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

18. Attendance Requirements

i) A student shall be eligible to appear for the external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the College.
iv) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.
vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.
viii) For induction programme attendance shall be maintained as per AICTE norms.

19. Promotion Rules

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per institution norms.

ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) up to in the subjects that have been studied up to III semester.

iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) in the subjects that have been studied up to V semester.
And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

iv) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

20. Grading

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points
		Assigned
90 & above	S (Superior)	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next

supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative GradePoint Average (CGPA): The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \Sigma (Ci \times Gi)/\Sigma Ci$$

where, Ci is the number of credits of the ith subject and Gi is the grade point scored by the student in the ith course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \Sigma (Ci \times Si)/ \Sigma Ci$$

where "Si" is the SGPA of the ith semester and Ci is the total numberof credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D and F.

Award of Class:
After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

CGPA to Percentage Conversion Formula – (CGPA – 0.5) x 10

21. Withholding of Results

If the candidate has any dues not paid to the institution or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

22. Multiple Entry / Exit Option

a. Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

b. Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Institution/University shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

23. Gap Year Concept

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the Institution . An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

24. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section **2** and they will follow the academic regulations into which they are readmitted.

25. Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90 days.

26. Medium of Instruction:

The medium of instruction of the entire B. Tech undergraduate programme in Engineering &Technology (including examinations and project reports) will be in English only.

27. Student Transfers:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the University/Institution from time to time.

28. General Instructions:

i) The academic regulations should be read as a whole for purpose of any interpretation.
ii) Malpractices rules-nature and punishments are appended.
iii) Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.
iv) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
v) The Institute may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the institute.
vi) In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Head of the institution is final.

*** *** ***

ACADEMIC REGULATIONS (DR24) FOR B.TECH. (LATERAL ENTRY SCHEME)

*(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year **2025-26** onwards)*

1. **Award of the Degree**

   a. **Award of the B.Tech. Degree / B.Tech. Degree with a Minor** if he/she fulfils the following:
      i. Pursues a programme of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
      ii. Registers for 120 credits and secures all 120 credits.

   b. **Award of B.Tech. degree with Honors** if he/she fulfils the following:
      i. Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
      ii. Registering for Honors is optional.
      iii. Honors is to be completed simultaneously with B.Tech. programme.

1. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

2. **Minimum Academic Requirements**

   The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.**2**

   i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together.
   ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.
   iii. And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

3. **Course Pattern**

   i. The entire course of study is three academic years on semester pattern.
   ii. A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.
   iii. When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

4. All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

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CDr. N. RAMA KRISHNAIAH
Professor & Head, Dept. of CSE

Head of the Dept.
Department of IT
D.N.R. College of Engg. & Tech.

D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)

BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

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Accredited with A^{++} Grade with 3.73/4 CGPA by NAAC and Accredited by NBA (B. Tech- CSE, ECE & EEE)

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CIRCULAR

Ref: *DNRCET/CSE/2024-25/BoS/C-2* **Date:** *20.03.2025*

It is to inform all BoS members of the CSE department to attend the BoS meeting to be conducted ***on 24th March, 2025*** at ***10:00 am.*** The following agenda is being discussed.

Agenda:

1. Introducing the members of Board of Studies.
2. Discussion on II year Semester I & II course structure for B. Tech (Computer Science & Engineering) and II Year Semester I & II for M. Tech (Computer Science & Engineering) Programs for the academic year 2025 – 26.
3. Discussion on preparation of course syllabus in accordance to JNTUK course structure and syllabus.
4. Discussion on Academic Regulations of both UG & PG Programs.
5. Discussion on preparation of course syllabus offered to other departments in accordance to JNTUK course structure and syllabus
6. Discussion and finalizing the model papers for the academic year 2025 – 26.
7. To discuss the Certificate Courses to be done by the students & staff.
8. To discuss the functional MoUs with the industries.
9. To discuss the feasibility of developing collaborations with other institutions.
10. To evolve a plan of action for consultancy activities.
11. Any other agenda with the permission of the chair.

20/3/2025

Chairperson Board of Studies / Head of the Department

Head of the Department
Department of Computer Science & Engineering
D.N.R. College of Engineering & Technology
BHIMAVARAM-534 202.

Copy to

1. The Members of BoS,
2. The Principal, DNRCET(A),
3. The Dean, Academics, DNRCET(A),
4. Office file.

D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Ref: *DNRCET/CSE/2024-25/BoS/MoM-2* **Date:** *24.03.2025*

Board of Studies (BoS) Minutes of Meeting

24th MARCH, 2025 at 10:00 am.

Agenda:

1. Introducing the members of Board of Studies.
2. Discussion on II year Semester I & II course structure for B. Tech (Computer Science & Engineering) and II Year Semester I & II for M. Tech (Computer Science & Engineering) Programs for the academic year 2025 – 26.
3. Discussion on preparation of course syllabus in accordance to JNTUK course structure and syllabus.
4. Discussion on Academic Regulations of both UG & PG Programs.
5. Discussion on preparation of II Year Semester I & II course structure and course syllabus offered to other departments in accordance to JNTUK course structure and syllabus for the academic year 2025 – 26.
6. Discussion and finalizing the model papers for the academic year 2025 – 26.
7. To discuss the Certificate Courses to be done by the students & staff.
8. To discuss the functional MoUs with the industries.
9. To discuss the feasibility of developing collaborations with other institutions.
10. To evolve a plan of action for consultancy activities.
11. Any other agenda with the permission of the chair.

The Board of Studies meeting held on 24th March, 2025 at 10:00 am through online & offline mode with the welcome speech by Dr. G. SATYANARAYANA, Professor & Head of department / Chairperson of BoS.

The points mentioned in the agenda were discussed, and the details are listed below:

Agenda No. 1: The Board of Studies (BoS) for Computer Science and Engineering department is constituted by the chairperson as per the guidelines of Academic Council. The Chairperson introduced all nominated Board of Studies members of department of Computer Science & Engineering to each other.

Agenda No. 2, 3, 4: The BoS members discussed on the agenda 2, 3, 4 and made the following resolutions.

Resolution on Agenda 2, 3, 4:

The members of the Board of Studies (BoS) and the chairperson made the decision to follow the JNTUK, Kakinada R-23 regulations for B. Tech Program and R-19 regulations for M. Tech Program that were put into place for second year students for the academic year 2025-2026. This included adhering the academic regulations, syllabi, model papers, and the evaluation procedure for semester-end examinations (SEE) and continuous internal evaluation (CIE).

Agenda No. 5: The BoS members discussed on the agenda 5 and made the following resolutions.

Resolution on Agenda 5:

The members of the Board of Studies (BoS) and the chairperson made discussion on preparation of computer science and engineering core courses, its course structure and course syllabus offered to other departments in accordance to JNTUK syllabus. It is decided to follow the JNTUK, Kakinada R-23 regulations for B. Tech Program without any modifications that were put into place for second year students for the academic year 2025-2026. This included adhering the academic regulations, syllabi, model papers, and the evaluation procedure for semester-end examinations (SEE) and continuous internal evaluation (CIE).

Agenda No.6: The BoS members discussed on the agenda 5 and made the following resolutions.

Resolution on Agenda 6:

As it is decided to adhere JNTUK, Kakinada R-23 model paper without any change in agenda 5. The chairperson of the BoS discussed and finalized with the model paper with two sections. Section- A consists of 10 small questions, each carry 2 marks and it should be 2 from each unit. The Section-B consists of five question with internal choice which carry 10 marks each and it should be each from one unit of the syllabus. All the members accepted unanimously and list is finalized and enclosed in Annexure G.

Agenda No.7: The BoS members discussed on the agenda 6 and made the following resolutions.

Resolution on Agenda 7:

To bridge the gap to academics and industry for 2nd year B.Tech., students from their previous learning method to problem solving method it is unanimously accepted to introduce the certificate courses to the student to improve their programming skills as well as increasing the concept of implementation skills.

Also accepted to introduce the certificate courses for the faculty members to enrich their knowledge levels in latest technological areas. All the members accepted unanimously and list is finalized and enclosed in Annexure H.

Agenda No.8: The BoS members discussed on the agenda 7 and made the following resolutions.

Resolution on Agenda 8:

To strengthen the students' skills conducting Guest Lectures, Workshops, Seminars and other co-curricular activities through MoUs with reputed organizations are required. Hence the BoS members agreed and advised to improve MoUs with reputed organizations/industries.

Agenda No.9: The BoS members discussed on the agenda 8 and made the following resolutions.

Resolution on Agenda 9:

To strengthen the department needs and to develop various skillset of the students it is advised to develop collaborations with the other institution. The BoS members advised to improve the collaboration with reputed institutions towards increasing technical workshops and FDP's and other mode of operations.

Agenda No.10: The BoS members discussed on the agenda 9 and made the following resolutions.

Resolution on Agenda 10:

To BoS members agree and advised to plan consultancy activities for the development of department.

Agenda No.11: As there is no other agenda for discussion; hence the chairperson advised to conclude the meeting with the permission of all the BoS members.

The entire meeting is recorded as video and stored in the department.

The meeting concluded at 11:30 a.m. with a vote of thanks by Dr. G. SATYANARAYANA, Chairperson of BoS / Professor & Head of the department.

University Nominee

(Dr. N. Rama Krishnaiah)
Professor & Head
Dept. of Computer Science & Engineering
UCEK, JNTUK, Kakinada, AP.

Chairperson Board of Studies / Head of the Department

Head of the Department
Department of Computer Science & Engineering
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Copy to:

1. Principal, DNRCET(A),
2. Dean, Academics, DNRCET(A),
3. Controller of Examinations, DNRCET(A),
4. Circulation among the faculty members, CSE Department, DNRCET(A),
5. File.

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BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester	Course Code: BT24CS2101	L	T	P	C
		3	0	0	3

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

Course Objectives:

The main objectives of the course are to

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

Course Outcomes:

At the end of the course students will be able to

1. Analyze worst-case running times of algorithms using asymptotic analysis (L4).
2. Apply Divide-and-conquer paradigm and explain when an algorithmic design situation calls for it (L3).
3. Apply Greedy Method paradigm (L3).
4. Develop dynamic programming algorithms for various real time applications (L6).
5. Illustrate and apply backtracking algorithms, further able to understand non-deterministic algorithms (L3).
6. Solve NP Completeness of problems (L5).

UNIT – I:

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.

AVL Trees – Creation, Insertion, Deletion operations and Applications B-Trees – Creation, Insertion, Deletion operations and Applications

UNIT – II:

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications .

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT – III:

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT – IV:

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT – V:

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Textbooks:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2nd Edition Universities Press
2. Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

Reference Books:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs:, N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. Abdul Bari, Introduction to Algorithms (youtube.com)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester	Course Code: BT24CS2102	L	T	P	C
		3	0	0	3

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

The learning objectives of this course are to:

- identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- understand how to design applications with threads in Java
- understand how to use Java APIs for program development

Course Outcomes:

At the end of the course students will be able to

1. Realize the concept of object oriented programming & Java programming constructs (L2).
2. Describe the basic concept of java such as operators, classes, objects (L2).
3. Describe the basic concept of java such as inheritance, packages, enumeration and various keywords (L2).
4. Apply the concepts of exception handling and Input / Output operations (L3).
5. Design the applications of Java & Java applet (L6)
6. Analyze & design the concept of Event handling and abstract window toolkit (L6)

UNIT I

Object Oriented Programming: Basic concepts, Principles,

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf () Method, Static Variables and Methods, Attribute Final.

Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator? Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three- dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto- boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, need for Multiple Threads Multithreaded Programming for Multi-Core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester	Course Code: BT24CS2103	L	T	P	C
		0	0	3	1.5

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB

Course Objectives:

The objectives of the course are to

- acquire practical skills in constructing and managing Data structures
- apply the popular algorithm design methods in problem-solving scenarios

Course Outcomes:

At the end of the course students will be able to

1. Analyze algorithms and determine algorithm correctness and time efficiency classes (L4)
2. Develop Programs for implementing trees and their traversal operations (L6)
3. Apply algorithm design techniques (L3)
4. Apply Greedy, divide and conquer algorithms (L3)
5. Develop dynamic programming algorithms for various real-time applications (L6)
6. Illustrate and apply backtracking algorithms, further able to understand non-deterministic algorithms (L4)

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix b) Adjacency Lists
5. Write a program for finding the biconnected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3) JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

1) The complete Reference Java, 11thedition, Herbert Schildt, TMH
2) Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester	Course Code: BT24CS2104	L	T	P	C
		0	0	3	1.5

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Objectives:

The aim of this course is to

- Practice object oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

Course Outcomes:

At the end of the course students will be able to

1. Apply control structures and operators for writing basic python programs (L3).
2. List various python data structure concepts and apply them to solve real world problems (L3).
3. Develop functions and examine various file handling techniques and apply them to solve real world problems (L6).
4. Build simple Modules used for solving real world Problems (L6).
5. Analyze object oriented concepts in Python (L4).
6. Develop, test various GUI application (L6).

Experiments covering the Topics:

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, Java FX GUI

Sample Experiments:

Exercise – 1:

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program implement method overloading.

c) Write a JAVA program to implement constructor.

d)Write a JAVA program to implement constructor overloading.

8. Implement Job Sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

Online Learning Resources:

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester	Course Code: BT24CS2105	L	T	P	C
		0	1	2	2

PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE)

Course Objectives:

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Course Outcomes:

At the end of the course students will be able to

1. Develop essential programming skills in computer programming concepts like datatypes, containers (L3)
2. Apply the basic of programming in the Python Language (L3)
3. Apply ode tasks related to conditional executions and loops (L3)
4. Apply coding tasks related to fundamental notations and techniques used in object oriented programming (L3)
5. Design and implement a program to solve a real world problem (L6)
6. Create a database connectivity in python programming language (L6)

UNTI-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators

Exercise - 4

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi-level Inheritance

c) Write a JAVA program for abstract class to find areas of different shapes

Exercise - 5

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

c) Write a JAVA program that implements Runtime polymorphism

Exercise - 6

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

c) Write a JAVA program for creation of Java Built-in Exceptions

d) Write a JAVA program for creation of User Defined Exception

Exercise - 7

a) Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)

b) Write a program illustrating **is Alive** and **join ()**

c) Write a Program illustrating Daemon Threads.

d) Write a JAVA program Producer Consumer Problem

Exercise – 8

a) Write a JAVA program that import and use the user defined packages

b) Without writing any code, build a GUI that display text in label and image in an Image View (use JavaFX)

c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise – 9

a) Write a java program that connects to a database using JDBC

b)Write a java program to connect to a database using JDBC and insert values into it.

c) Write a java program to connect to a database using JDBC and delete values from it

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viii) Identity Operators

5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II:

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
    i. additionii. insertioniii. slicing
6. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple () Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, using zip () Function, Sets, Set Methods, Frozenset.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

UNIT-IV:

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data

Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V:

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
   a) Apply head () function to the pandas data frame
   b) Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Course Code: BT24CS2201	L	T	P	C
		3	0	0	3

OPERATING SYSTEMS

Course Objectives:

The main objectives of the course are to make student

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

Course Outcomes

Upon successful completion of this course, the student should be able to

1. Describe various generations of Operating Systems and functions of Operating Systems (L2).
2. Describe the concept of program, process and thread (L2).
3. Analyze various CPU Scheduling Algorithms and compare their performance (L4).
4. Solve Inter Processes Communication problems using Mathematical Equations by various methods (L3).
5. Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques (L5).
6. Outline File Systems in Operating System like UNIX / Linux and Windows (L4).

UNIT - I

Operating Systems Overview: Introduction, operating system functions, operating systems operations, Computing environments, Free and Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, operating system Design and Implementation, operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT - II

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication.

Threads and Concurrency: Multithreading models, Thread libraries, Threading issues.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT – III

Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT - IV

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.

Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT - V

File System: File System Interface: File concept, Access methods, Directory Structure; File system **Implementation:** File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.

Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

Text Books:

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

Reference Books:

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw-Hill, 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html/

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D.N.R. College of Engineering & Technology
BHIMAVARAM-534 202.

BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Course Code: BT24CS2202	L	T	P	C
		3	0	0	3

DATABASE MANAGEMENT SYSTEMS

Course Objectives:

The main objectives of the course are to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes

Upon successful completion of this course, the student should be able to

1. Determine the basic concept and applications of database system (L3)
2. Describe the data models and schemes in Database Management Systems (L3)
3. Understand the relational databases system using relational operators in queries (L2)
4. Use SQL standard language queries on database (L6)
5. Analysis the functional dependencies and design of database (L4)
6. Apply the issues of managing the data such as efficiency, privacy, security and ethical responsible (L3)

UNIT I:

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT II:

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus.

BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III:

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion). Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view (updatable and non-updatable), relational set operations.

UNIT IV:

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd Normal Form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V:

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing:

Text Books:

1) Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2) Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

Reference Books:

1) Introduction to Database Systems, 8thedition, C J Date, Pearson.
2) Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Course Code: BT24CS2203	L	T	P	C
		2	1	0	3

SOFTWARE ENGINEERING

Course Objectives:

The objectives of this course are to introduce

- Software life cycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

Course Outcomes

Upon successful completion of this course, the student should be able to

1. Explain software engineering principles involved in the building large software programs and process of requirement specification and requirements validations (L2).
2. Explain the concepts of ability and the Cost of Change and development of Use Cases, Building the Requirement model (L2)
3. Analyze Requirements Analysis and System models for designing patterns (L4).
4. Skills to Design, implement, and execute test cases at the Unit and Integration Level (L5).
5. Evaluate the importance of software maintenance and complexities involved in software evaluation (L6).
6. Apply estimation techniques, scheduling project activities and compute pricing and Compare conventional and agile software methods (L3)

UNIT I:

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

UNIT II:

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT III:

Software Design: Overview of the design process, how to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.
User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT IV:
Coding and Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, Testing object-oriented programs, Smoke testing, and Some general issues associated with testing.
Software Reliability and Quality Management: Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000.SEI Capability maturity model. Few other important quality standards, and Six Sigma.

UNIT V:
Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.
Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.
Software Reuse: reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

Text Books:
1. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A Practitioner's Approach, Roger S. Pressman, 9th Edition, Mc- Graw Hill International Edition.

Reference Books:
1. Software Engineering, Ian Sommerville,10th Edition, Pearson.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105182/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01338269041100390473 5_shared/overview

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Course Code: BT24CS2205	L	T	P	C
		0	0	3	1.5

DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

Upon successful completion of this course, the student should be able to

1. Utilize SQL to execute queries for creating database and performing data manipulation operations (L6)
2. Apply integrity constraints to build efficient databases (L3)
3. Apply Queries using Advanced Concepts of SQL (L3)
4. Build PL/SQL programs including stored procedures, functions (L6).
5. Build PL/SQL programs cursors and triggers (L6).
6. Establish the connection between database using JDBC / ODBC (L6)

Experiments covering the topics:

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

Sample Experiments:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)

5.

i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)

ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non- indexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

Text Books/Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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DEPARTMENT OF BASIC SCIENCE AND HUMANITIES

Dept of Basic Sciences & Humanities (Mathematics) Meeting of B O S Schedule, A. Y. 2025-26

Minutes of meeting of Board of Studies, Dept of Basic Sciences & Humanities (Mathematics) Held on 04-04-2025 at 09:30 A. M with the following points of agenda.

Venue: English Language Lab
Meeting held on: 04-04-2025 at 10:30 A. M
Mode of conducting meeting: Online Zoom App
Meeting link:

https://us05web.zoom.us/j/85622006591?pwd=e1XaO4KGbua0hl3ih68GP7V54KcJCu.1

Agenda:

1. Welcome speech by Chairperson
2. Introduction of members
3. To discuss and finalize the proposed DR -24 syllabus for II B. Tech I & II Semester for A.Y; 2025-26 onwads. [Annexure-A]
4. Finalization of Model question Paper and List of question Paper Setters.[Annexure-B]
5. To discuss and finalize the Evaluation procedure for Continuous Internal Evaluation(CIE) and Semester End Evaluation (S E E) [Annexure- C]
6. Ratification of Course Objectives and Course Outcomes, C O–P O mapping for the proposed subjects [Annexure- D].
7. Finalization of Text Books and Reference Books.[Annexure-E]
8. Any other item with the permission of the chairman.

Members Present:

S. No.	Name(s) of the Member(s)/	Designation	Designation in Committee	Status Attending	Signature
1.	Dr G G Ratnam	Professor & Head, Dept of B S&H	Chairperson	Yes	
2.	Dr V Ravindranath	Professor & Head, Dept of Mathematics J NT UK, Kakinada	Member (University Nominee)	Yes	
3.	Dr M Pushpa Latha	Dept of Mathematics S RK R Engineering College, Bhimavaram	Member (Subject expert)	Yes	online
4.	Dr Sd Sadik	Professor &H OD Dept of FED, C RR Engineering College, Eluru	Member(Subject expert)	Yes	Online
5.	Ms. P Keerthi	Asst. Prof, DNRCET	Member	Yes	
6.	Mrs. G Teja Sowmya	Asst. Prof, DNRCET	Member	Yes	
7.	Mrs. V Vijaya Durga	Asst. Prof, DNRCET	Member	Yes	
8.	Mrs. N Madhavi	Asst. Prof, DNRCET	Member	Yes	
9.	Ms. P Venu Madhuri	Asst. Prof, DNRCET	Member	Yes	
10.	Mr. B. Pradeep	Asst. Prof, DNRCET	Member	Yes	
11.	Mrs. K Ramya Sri Krishna	Asst. Prof, DNRCET	Member	Yes	
12.	Mr. T. Pranams	Managing Director Pranams Hotels, Bhimavaram	Member (Industrial Expert)	Yes	
13.	Ms. K. Siva Syamala	R. No:149 P5 A0503 Batch:2013-17	Member (College alumni)	Yes	K.S.Syamala

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DEPARTMENT OF BASIC SCIENCE AND HUMANITIES

Resolutions

At the outset, Dr M Anjan Kumar , Principal of DNRCET presented his gratitude to the university nominee Dr V Ravindranath and other members of BOS Subject experts Dr Sd Sadik and Dr M Pushpa Latha for their support and cooperation and handed over the session to the chairman of B O S.

Resolutions-1:

The chair person of the BOS greeted the university nominee Prof. Dr.Ravidranath and other subject experts. On the behalf of DNRCET, he welcome all BOS members.

Resolutions-2:

The BOS chairman welcomed and introduced the eminent members of BOS to the Meeting. He briefed them about structure and pattern of the course. The BOS members expressed their appreciation for structure of curriculum and content of the course. The chairman of B O S placed the agenda for the deliberation of the members. The following deliberations were made as per the items of circular agenda.

Resolutions-3:

After through discussions, the BOS considered and approved, the DR24 course structure and syllabus for II B Tech I&II semesters (U G) courses to be taught by faculty of Mathematics, Department of Basic Sciences and Humanities (B S H) from the academic year 2025-26 onwards.

The list of II B.Tech I & II semesters subjects are approved by the BOS members.

Subjects:

1. Numerical Techniques and Statistical Methods
2. Complex Variables and numerical methods
3. Numerical Methods and Transform Techniques
4. Discrete Mathematics and graph theory
5. Complex Variables, Probability and statistics
6. Probability and statistics
7. Statistical methods for data science

Resolutions-4:

The BOS discussed and approved of the model question papers and list of question paper setters.[Annexure-B]

Resolutions-5:

The BOS discussed and approved the evaluation procedure of Continuous Internal Evaluation (CIE) and Semester End Evaluation (S E E) [Annexure-C]

Resolutions-6:

The BOS approved Course Objectives and six Course Outcomes from five units of all II B.Tech I & II semesters course and CO – P O Mapping of the Mathematics courses. [Annexure-D]

Resolutions-7:

The BOS discussed and suggested the text books and reference books for all Mathematics courses and also suggested to prefer local author text book for the benefit of the rural background students. [Annexure-E]

Resolutions-8:

The JNTUK nominee has suggested that Probability and Stotastic Process should be changed from BSH to professional core.

At the end , the chairman concluded the BOS meeting by summarizing all the agenda points and resolutions.

[Annexure-A]

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DEPARTMENT OF BASIC SCIENCE AND HUMANITIES

DR 24 - II Year COURSE STRUCTURE & SYLLABUS
INFORMATION TECHNOLOGY

B. Tech. II Year–I Semester

S. No	Category	Title	L	T	P	C
1	B S&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	B S&H	Universal human values–understanding harmony and Ethical human conduct	2	1	0	3
3	Engineering Science	Digital Logic & Computer Organization	3	0	0	3
4	Professional Core	Advanced Data Structures & Algorithms	3	0	0	3
5	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6	Professional Core	Advanced Data Structures Lab	0	0	3	1.5
7	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	Skill Enhancement course	Python Programming	0	1	2	2
9	Audit Course	Environmental Science	2	0	0	-
Total			16	2	8	20

B. Tech. II Year–II Semester

S. No	Category	Title	L	T	P	C
1	Management Course-I	Optimization Techniques	2	0	0	2
2	Engineering Science/ Basic Science	Probability & Statistics	3	0	0	3
3	Professional Core	Operating Systems	3	0	0	3
4	Professional Core	Database Management Systems	3	0	0	3
5	Professional Core	Software Engineering	3	0	0	3
6	Professional Core	Operating Systems & Software Engineering Lab	0	0	3	1.5
7	Professional Core	Database Management Systems Lab	0	0	3	1.5
8	Skill Enhancement Course	Python with D Jango	0	1	2	2
9	B S&H	Design Thinking & Innovation	1	0	2	2
Total			15	1	10	21
Mandatory Community Service Project Internship of 08 weeks duration during Summer vacation						

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[Annexure-A]

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DEPARTMENT OF BASIC SCIENCE AND HUMANITIES

II Year I Semester

DISCRETEMATHEMATICS AND GRAPHTHEORY

For CSE,CSE (AI&ML),AI&DS,IT

Course Objectives:

- To introduce the students to the topics and techniques of discrete methods and Combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

Course Outcomes:

At the end of the course students will be able to

1. Build skills in solving mathematical problems
2. Comprehend mathematical principles and logic
3. Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
4. Differentiate between ordinary and circular permutations
5. Manipulate and analyzed at a numerically and/ or graphically using appropriate Software
6. How to communicate effectively mathematical ideas/results verbally or in writing

UNIT–I: Mathematical Logic

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological
Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus

UNIT-II: Set Theory

Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

UNIT-III: Combinatorics and Recurrence Relations

Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

Recurrence Relations

Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving in homogeneous Recurrence Relation

UNIT-I V:Graph Theory

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs

DEPARTMENT OF BASIC SCIENCE AND HUMANITIES

Unit-V: Multi Graphs

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, B F S and D F S
Spanning Trees

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Trembly and P. Manohar, Tata Mc Graw Hill.
2. Elements of Discrete Mathematics–A Computer Oriented Approach, C. L. Liuand D. P. Mohapatra, 3rd Edition, Tata Mc Graw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, Mc Graw Hill.

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busbyand Sharon Cutler Ross, P H I.
3. Discrete Mathematics, S. K. Chakraborthy and B. K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K.H. Rosen, 7th Edition, Tata Mc Graw Hill.

HEAD
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[Annexure-A]

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DEPARTMENT OF BASIC SCIENCE AND HUMANITIES

II Year II Semester

PROBABILITY AND STATISTICS
For CSE, CSE (AI&ML),IT

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various application Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to

1. Classify the concepts of data science and its importance
2. Interprete association of characteristics and through correlation and regression tools
3. Apply discrete and continuous probability distributions
4. Identify and apply appropriate probability distributions to real world problems
5. Design the components of a classical hypothesis test
6. Infer the statistical inferential methods based on small and large sampling tests

UNIT– I: Descriptive statistics and methods for datascience:

Data science–Statistics Introduction–Population vs Sample –Collection of data –primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability – Skewness Kurtosis.

UNIT–II: Correlation and Regression:

Correlation – Correlation coefficient–Rank correlation.
Linear Regression:Straight line–Multiple Linear Regression-Regressioncoefficientsand properties – Curvilinear Regression: Parabola – Exponential – Power curves.

UNIT–III: Probability and Distributions:

Probability–Conditional probability and Baye's theorem–Random variables–Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions

UNIT–IV: Sampling Theory:

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Point and Interval estimations – Maximum error of estimate–Central limit theorem (without proof) – Estimation using t, $\chi 2$ and F-distributions.

U N I T– V:Tests of Hypothesis:

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type I I errors – Level of significance – One tail and two-tail tests – Test of significance for large samples and Small Samples:Single and difference means – Single and two proportions–Student's t- test, F-test, $\chi 2$ -test.

TEXT BOOKS:

1. Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

REFERENCE BOOKS:

1. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
2. Jayl. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and physical scientists, 3rd Edition, Pearson, 2010

P. K. T.

R. T 08/04/2025

V. Durgaprasad

N. Madhusudhan 8/4/25

G. Tejaswini 8/4

P. Venu Madhuri 8/4/2025

K. R. S. Kavitha

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Department of Electronics & Communication Engineering

To

The Head of the Department,
Department of EEE / ME / CSE / AI & ML / AI & DS / IT,
DNR College of Engineering & Technology,
Balusumudi, BHIMAVARAM – 534202,
West Godavari District, A.P., India.

Respected Sir,

Sub: Submission of Course Syllabus of offered to concern department(s) – Reg.

* * *

I Dr. K. Venu Gopal, Associate Professor & Head, Department of ECE herewith submitting the course syllabus along with the minutes, approved in the BoS meeting of the department. Kindly go through the syllabus for the academic year 2025 -2026.

Thanking You,

Yours Faithfully,

K Venu Gopal 9/5/25
(Dr. K. Venu Gopal),
Associate Professor & Head,
Department of ECE, DNRCET (A).

Copy submitted to:

Department	EEE	ME	CSE	AI & ML	AI & DS	IT
Signature of HoD						

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(AUTONOMOUS)
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Accredited with A++ Grade by NAAC & Accredited by NBA (B. TECH – CSE, ECE & EEE)
Ph: 08816-221238 Email: dnrcet@gmail.com website: https://dnrcet.org
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Bhimavaram,
26/03/2025.

Ref: DNRCET/ECED/2025-26/BOS-MOM/1

Minutes of Meeting (MOM) of the Board of Studies (BOS)

The 2nd Board of Studies (BOS) meeting for the A.Y: 2025-26 of the Electronics & Communication Engineering (ECE) Department was held on Wednesday, 26/03/2025, at 10:30 AM in the R & D Lab in online mode (Zoom online meeting platform) to discuss the proposed agenda and to adopt resolutions.

Meeting link
https://us06web.zoom.us/j/84974670871?pwd=SMklaoufKbpwfBLwuOyJhzuTtmqe6J.1

Agenda:

1. **Welcome Speech by the Chairperson.**
2. **Introducing the members of the Board of Studies.**
3. **To discuss and finalize the proposed II B. Tech. I & II Semester Course Structure and Syllabus & II M. Tech III & IV Semester of DR-24 Regulations.**
4. **Ratification of Course Objectives and Course Outcomes for the Proposed Curriculum.**
5. **Finalization of Model Question Papers.**
6. **Any other item with the permission of the chair.**

The following members attended the meeting:

Name(s) of the Member(s)/Nominee(s)	Designation in Committee	Signature
Dr. K. Venu Gopal	**Chairperson**	K Venu Gopal
Dr. B. T Krishna, Professor, ECE Department, University College of Engineering, Kakinada, AP-533003. e-mail: tkbattula@jntucek.ac.in Mobile: 9502770755.	**Member** **(University Nominee)**	B. T. Krishna
Dr. N. Udaya Kumar, Professor & HOD, ECE Dept,	**Member**	on-line Attended.

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

SRKR Engineering. College (Autonomous), Bhimavaram-534202, e-mail: nuk@srkrec.ac.in Mobile: 9440354093.	**(Subject experts from outside the parent University)**	
Dr. P. Srinivasa Rao, Assoc. Professor, ECE Dept., St. Anna's College of Engineering & Technology (Autonomous), Chirala-523187 e-mail: psraoece@gmail.com Mobile: 6281266754.	**Member (Subject experts from outside the parent University)**	On-Line Attended
Mr. Sriramulu Govada, Design. Technical Officer 'A', DRDO. Visakhapatnam, e-mail: sriramgovada@gmail.com Mobile: 9492126360.	**Member (Industrial Expert)**	On-Line Attended
Mrs. I. Pavani, 2016-20 Batch, Roll No.169P1A0416, e-mail: pavaniindukuri123@gmail.com, Mobile No: 63039 84842.	**Member (College alumni)**	On-Line Attended.
Dr. Nekkanti Venkata Rao	**Members of the Department**	
Dr A. Purna Ramesh		
Dr. S. Ravi chandh		
Mr. Kopalli Venkanna Naidu		
Mr. Kurma Sekhar Babu		
Mr. S Satish Kumar		
Mrs. N Mary Leena		

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Mr.M. Venu		
Mrs.K Indira Priyadarsini		
Mrs. B. Nagamani		
Mrs. Rosey Sharon		
Mr. P. Gopala Swami		
Mr. Rakesh Patnaik		
Mrs. P. Srivalli		
Mr. Vendra Bhavani Durga		
Mrs. K. Durga		
Mr.B. Sudhakar		
Mrs. K. Vanaja		
Mrs. U. Sai Mounica		
Mr.S. Joseph		

The BoS meeting began with the DNRCET Principal thanking the university nominee and other members of the BoS. He then turned the session over to Dr. K. Venu Gopal, the BOS chairman of the ECE department. The following resolutions were established during the BoS meeting:

Resolutions:

Agenda Point 1: Welcome speech by the chairperson

Resolution: The chairman of BoS, Dr. K. Venu Gopal, welcomed internal and external BOS members.

Agenda Point 2: Introduction of members

Resolution: The Chairman of BoS, Dr. K. Venu Gopal, welcomed all the members and introduced internal BoS members to external BoS members.

The meeting began with the II B. Tech curriculum presentation for semesters I & II.

Agenda Point 3: To discuss and finalize the proposed II B. Tech-I & II Semester ECE (Theory and Lab) courses & II M. Tech DECS III & IV Semester (Theory and Lab) of DR24 Regulations.

Resolution: After clearly discussing every unit of theory courses, namely Probability Theory and Stochastic Process, Signals and Systems, Electronic Devices and Circuits, Switching Theory and Logic Design, Electronic Devices and Circuits Lab, Switching Theory and Logic Design Lab Linear Control Systems, Electromagnetic Waves and Transmission Lines, Electronic Circuit Analysis, Analog Communications, Signals and Systems Lab, Electronic Circuit Analysis Lab, and various open electives offered by ECE Department namely 1. Basics of Signals and Systems

2. Electronic Measurements and Instrumentation 3. Principles of Signal Processing 4. Industrial Electronics 5. Consumer Electronics 6. Fundamentals of Microprocessors and Microcontrollers 7. Transducers and Sensors 8. IOT and Applications 9. IC Applications 10. Principles of Communications 11. Basic Electronics 12. Data Communications 13. Digital Logic design and Embedded Systems & IoT lab for II B.Tech-I semester, ME department. In this meeting, the finalization of course content for the Digital Logic & Computer Organization course for II B. Tech-I semester for CSE, IT and allied branches of CSE (AIDS &AIML) for II B. Tech-II semester and Analog Circuits for II B. Tech-II semester EEE department is completed. After the discussion of II B. Tech-I & II Semesters courses, the chairman and all BoS members discussed the course of II M. Tech III & IV Semester the courses are Detection & Estimation Theory, Advanced Digital Signal Processing, Coding Theory and Applications, Operations Research, Dissertation Phase -I & Dissertation Phase - II.

After Conversation, the university nominee and all the other BoS members finalized that the same syllabus and regulations in R23 are in corporate in DR 24 II B. TECH I & II syllabus and regulations DR 24 II M. Tech III & IV semester syllabus is same as JNTUK K Kakinada R19 regulations The detailed syllabus is attached.
Annexure-A **(Enclosed Annexure-A).**

Agenda Point- 4: Ratification of Course Objectives and Course Outcomes for the proposed subjects.

Resolution: After an extensive discussion, the BoS approved the proposed course objectives and outcomes. These are based on the changes made to the theory and labs as mentioned in agenda point -3.

Agenda Point- 5: Finalization of Model Paper. `

Resolution: The BoS members suggested appropriately naming the COs in the order that the questions stipulated and substituting Bloom's Level (BL) for KL (Knowledge Level). They also recommended giving a few long-answer questions a score of four or six out of ten. Accordingly, following confirmation of the Course Objectives (COs), Bloom's Taxonomy levels, and mark distribution, the suggested model question papers for external examinations of theory courses were approved. Annexure-B **(Enclosed Annexure -B).**

Agenda Point 6: Any other item with the permission of the chair.

Resolution: The Chairman concluded with a vote of thanks after summarizing the agenda and resolutions and thanking each member of the Board of Studies for their cooperative efforts.

Note: All conversations from the BoS meetings are captured on the Zoom platform and kept in the Department's records.

K Venu Gopal
Chairman, BoS

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

II Year-I Semester	Course Code: BT24EC2107	L	T	P	C
		3	0	0	3

Digital Logic & Computer Organization

Course Objectives:

The main objectives of the course is to

- provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

Course Outcomes:

At the end of the Course, Student will be able to:

- To learn different number systems and basic structure of computer system.
- To demonstrate the arithmetic algorithms.
- To explain the basic concepts of digital components and processor organization.
- To explain the generation of control signals of computer.
- To demonstrate the memory organization.
- To describe the concepts of parallel processing and different Buses.

UNIT – I:

Data Representation: Binary Numbers Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes.

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers.

UNIT – II:

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters.

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von-Neumann Architecture.

UNIT – III:

Computer Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control.

UNIT – IV:

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

UNIT – V:

Input / Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

Textbooks:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill.
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

Reference Books:

1. Computer Systems Architecture, M. Moris Mano, 3rdEdition, Pearson.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier.
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/103/106103068/

K Venu Gopal
Head
Department of ECE
D.N.R. College of Engg. & Tech.
BHIMAVARAM-534 202.

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II Year I Semester

L	T	P	C
2	1	0	3

UNIVERSAL HUMAN VALUES –

UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Sub Code: BT24HS2101 (DR-24)

UNIT I

Introduction to Value Education (6 lectures and 3 tutorials for practice session)
Lecture1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about One self Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity–the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session) Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self Lecture 10:
Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body
Lecture12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III

Harmony in the Family and Society (6 lectures and 3tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society
Lecture18: Vision for the Universal Human Order
Tutorial9: Practice Session PS9 Exploring Systems to fulfill Human Goal

UNIT IV

Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture22: The Holistic Perception of Harmony in Existence
Tutorial11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V

Implications of the Holistic Understanding–a Look at Professional Ethics(6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial12:PracticeSessionPS12ExploringEthicalHumanConduct
Lecture25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession Tutorial14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education PS1
Sharing about Oneself
PS2 Exploring Human Consciousness PS3
Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being PS4
Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self PS6
Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society PS7
Exploring the Feeling of Trust
PS8ExploringtheFeelingofRespect
PS9ExploringSystemstofulfilHumanGoal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence) PS10
Exploring the Four Orders of Nature
PS11ExploringCo-existenceinExistence

PracticeSessionsforUNITV–ImplicationsoftheHolisticUnderstanding–aLookatProfessional Ethics
PS12ExploringEthicalHumanConduct
PS13ExploringHumanisticModelsinEducation
PS14ExploringStepsofTransitiontowardsUniversalHumanOrder

READINGS:
Textbook and Teachers Manual
a. TheTextbook

HOD
MBA Department
D.N.R. College of Engg. & Tech.
BHIMAVARAM-534 202, A.P.

Prof. P.UMA MAHESWARI DEVI, MBA, M.Com., M.Phil. Ph.D.
Department of Commerce & Management Studies
Adikavi Nannaya University
Rajamahendravaram-533296
East Godavari District., A.P.

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DEPARTMENT OF MECHANICAL ENGINEERING

Dt: 02-05-2025.

To
The Principal,
DNRCET (A).

Sir,

Sub: Ratification of Design Thinking & Innovation with subject code BT24ME2207 (DR24) in BOS of ME Dept - Regd

I would like to bring to your notice that the subject **"Design Thinking & Innovation"** with subject code **BT24ME2207**is ratified in our Department's Board of Studies (BOS) meeting.

I request all the departments having the **Design Thinking & Innovation** subject in their course structure to follow the enclosed syllabus and the subject code.

Thanking you sir,

Yours Sincerely,

2/5/25

Dr. I. Harish
HoD, Department of Mechanical Engineering
D.N.R. College of Engineering & Technology

Head of the Department
Mechanical Engg.
D.N.R. College of Engg. & Tech.
BHIMAVARAM-534 202

Copy to.

HODs	CE	EEE	ECE	CSE	MBA.
	IT	AIML		AIDS	

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DEPARTMENT OF MECHANICAL ENGINEERING

II Year II Semester

L	T	P	C
1	0	2	2

DESIGN THINKING & INNOVATION (BT24ME2207)

Course Objectives: The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

21/5/25

Head of the Department
Mechanical Engg.
D.N.R. College of Engg. & Tech.
BHIMAVARAM-534 202

UNIT – V **Design Thinking in Business Processes**

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

Course Outcomes:

COs	Statements	Blooms Level
CO1	Define the concepts related to design thinking.	L1
CO2	Explain the fundamentals of Design Thinking and innovation.	L2
CO3	Apply the design thinking techniques for solving problems in various sectors.	L3
CO4	Analyse to work in a multidisciplinary environment.	L4
CO5	Evaluate the value of creativity.	L5

2/5/25

Head of the Department
Mechanical Engg.
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PROCEEDINGS OF THE
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
Kakinada-533003, Andhra Pradesh (India)

Proc. No. JNTUK/DAP/Evaluation Procedure for DT&I/Approval/2025 Date: 27.01.2025

Sub: DAP – Academic Planning – Evaluation Procedure for Design Thinking and Innovation (L-T-P-C) (1-0-2-2) - Orders - Issued.

Read: e-Office No. 2690537 approved by Honourable Vice Chancellor dated 27.01.2025

***

ORDER:

With reference cited above, the Honorable Vice Chancellor, JNTUK is pleased to approve the recommendations for Evaluation Procedure for Design Thinking and Innovation (L-T-P-C) (1-0-2-2) as follows:

- **Evaluation Procedure for Design Thinking and Innovation (L-T-P-C) (1-0-2-2):**

The performance of a student **for Design Thinking and Innovation** shall be evaluated with a maximum of 100 marks.
A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together.

Assessment Method	Marks
Internal Assessment	30
Semester End Examination	70
Total	**100**

The distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

a) Internal Evaluation Procedure

i) **Of the internal marks of 30, Day to Day Evaluation in the lab will be given a maximum of 7.5 Marks (25%) and Mid Exam(theory), a maximum of 22.5 Marks (75%).**

ii) During the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment. **30 Marks will be scaled down to 22.5 Marks.**

a. Objective paper shall contain for 05 short answer questions with 2 marks each OR maximum of 20 bits for 10 marks.
b. Subjective paper shall contain 3 questions of internal choice (i.e., either-or type questions of which student has to answer one from each either-or type of questions, each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.
c. 5 marks for assignment
d. Mid examinations of Design thinking and Innovation to be conducted by the corresponding college.

Note:

- The subjective paper shall contain 3 either-or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

vi) If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

b) End Examination (Only Practical's) Evaluation:
The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

- Procedure: 20 marks
- Experimental work & Results: 30 marks
- Viva voce: 20 marks.

REGISTRAR
REGISTRAR
J.N.T. University Kakinada
Kakinada-533003.

To
The Director of Evaluation, JNTUK Kakinada.
Copy to the Director, Academic Planning, JNTUK Kakinada.
Copy to the Secretary to Hon'ble Vice-Chancellor, JNTUK Kakinada.
Copy to the PA to the Registrar, JNTUK Kakinada.