



VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

An Autonomous Institution

(Sponsored by Lavu Educational Society)

[Affiliated to JNTUH, Hyderabad & Approved by AICTE, New Delhi]



Department of Computer Science and Engineering (AI&ML)

BOARD OF STUDIES

S. No.	Name	Designation	Organization	Position in BoS
1	Dr. M. Vishnu Vardhana Rao	Associate Professor & HOD	VMTW, Hyderabad.	Chairman
2	Dr. Ch. Asha Jyothi	Associate Professor	JNTUH, Wanaparthi	Member (JNTUH Nominee)
3	Dr. P. Madhuravani	Senior Consultant	Centroid IT Systems, Hyd.	Member (Industry)
4	Dr. B. Vasavi	Assistant Professor	MVSR College, Hyderabad.	Member (Academician)
5	Dr. Killi Prakasa Rao	Assistant Professor	NIT, Warangal.	Member (Academician)
6	Ms. R. Sindhura	Jr. Technical Content Engineer	Tutorials Point, Hyderabad.	Member (Alumni)
7	Dr. M. Thejovathi	Associate Professor	VMTW, Hyderabad.	Member
8	Mr. B. Balakrishna	Assistant Professor	VMTW, Hyderabad.	Member
9	Mr. D. Bikshalu	Associate Professor	VMTW, Hyderabad.	Member
10	Mr. S. Jayanna	Assistant Professor	VMTW, Hyderabad.	Member
11	Mrs. V.Rupa	Assistant Professor	VMTW, Hyderabad.	Member
12	Mr. S. Sandeep Babu	Assistant Professor	VMTW, Hyderabad.	Member
13	Mrs. Ch. Swapna	Assistant Professor	VMTW, Hyderabad.	Member
14	Mr. N. Bhargav Krishna	Assistant Professor	VMTW, Hyderabad.	Member

(Dr. G Apparao Naidu)

Vignans Institute of Management and Technology For Women
Kondapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt)-501301,
Telangana State



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Department of Computer Science and Engineering (AI&ML)

3rd. BoS Meeting on 9th January 2026

AGENDA

Item No.	Agenda Item																													
1.0	Review and Confirmation of Items																													
1.1	Review and confirmation of the Minutes of Meeting of the 2 nd BoS held on 18 th August 2025.																													
2.0	Approval Items																													
	VR25																													
2.1	Approval of VR25-II B. Tech I & II Semester Course Structure.																													
2.2	Approval of Syllabus for VR25-II B. Tech I Semester.																													
2.3	Approval of Syllabus for VR25-II B. Tech II Semester.																													
2.4	Approval of B. Tech Syllabi of other departments for VR25.																													
	<table><tr><th>S.No.</th><th>Regulation</th><th>Year & Sem</th><th>Subject Name</th><th>Department</th></tr><tr><td>1</td><td>VR25</td><td>II-I</td><td>Node JS/React JS/Django</td><td>CSE, CSE(DS)</td></tr><tr><td>2</td><td>VR25</td><td>II-II</td><td>Machine Learning</td><td>CSE, CSE(DS)</td></tr><tr><td>3</td><td>VR25</td><td>II-II</td><td>Machine Learning Lab</td><td>CSE, CSE(DS)</td></tr><tr><td>4</td><td>VR25</td><td>II-II</td><td>Node JS/React JS/Django, UI Design – Flutter</td><td>IT</td></tr></table>					S.No.	Regulation	Year & Sem	Subject Name	Department	1	VR25	II-I	Node JS/React JS/Django	CSE, CSE(DS)	2	VR25	II-II	Machine Learning	CSE, CSE(DS)	3	VR25	II-II	Machine Learning Lab	CSE, CSE(DS)	4	VR25	II-II	Node JS/React JS/Django, UI Design – Flutter	IT
S.No.	Regulation	Year & Sem	Subject Name	Department																										
1	VR25	II-I	Node JS/React JS/Django	CSE, CSE(DS)																										
2	VR25	II-II	Machine Learning	CSE, CSE(DS)																										
3	VR25	II-II	Machine Learning Lab	CSE, CSE(DS)																										
4	VR25	II-II	Node JS/React JS/Django, UI Design – Flutter	IT																										
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2.6	Approval of VR24-IV B. Tech I & II Semester Course Structure.																													



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2.7	Approval of Syllabus for VR24-III B. Tech I & II Semester.				
2.8	Approval of Syllabus for VR24-IV B. Tech I & II Semester.				
2.9	Approval of B. Tech Syllabi of other departments for VR24.				
	S.No.	Regulation	Year & Sem	Subject Name	Department
	1	VR24	III-I	UI design- Flutter	CSE, IT
	2	VR24	III-I	Machine Learning	IT
	3	VR24	III-I	Machine Learning Lab	IT
	4	VR24	III-II	Machine Learning	CSE, CSE(DS)
	5	VR24	III-II	Artificial Intelligence	CSE
	6	VR24	III-II	Machine Learning Lab	CSE, CSE(DS)
	7	VR24	III-II	Artificial Intelligence Laboratory	CSE
	8	VR24	IV-II	Artificial Intelligence (PE-V)	ECE
	9	VR24	IV-II	Machine Learning (PE-V)	ECE
3.0	Any other items with permission of Chair				


Chairman-BoS





VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

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Department of Computer Science and Engineering (AI&ML)

3rd. BoS Meeting 9th January 2026

Members Present:

S. No.	Name	Designation	Organization	Position in BoS	Signature
1	Dr. M. Vishnu Vardhana Rao	Associate Professor & HOD	VMTW, Hyderabad.	Chairman	
2	Dr. Ch. Asha Jyothi	Associate Professor	JNTUH, Wanaparthy	Member (JNTUH Nominee)	
3	Dr. P. Madhuravani	Senior Consultant	Centroid IT Systems, Hyd.	Member (Industry)	
4	Dr. B. Vasavi	Assistant Professor	MVSR College, Hyderabad.	Member (Academician)	
5	Dr. Killi Prakasa Rao	Assistant Professor	NIT, Warangal.	Member (Academician)	
6	Ms. R. Sindhura	Jr. Technical Content Engineer	Tutorials Point, Hyderabad.	Member (Alumni)	
7	Dr. M. Thejovathi	Associate Professor	VMTW, Hyderabad.	Member	
8	Mr. B. Balakrishna	Assistant Professor	VMTW, Hyderabad.	Member	
9	Mr. D. Bikshalu	Associate Professor	VMTW, Hyderabad.	Member	
10	Mr. S. Jayanna	Assistant Professor	VMTW, Hyderabad.	Member	
11	Mrs. V.Rupa	Assistant Professor	VMTW, Hyderabad.	Member	
12	Mr. S. Sandeep Babu	Assistant Professor	VMTW, Hyderabad.	Member	
13	Mrs. Ch. Swapna	Assistant Professor	VMTW, Hyderabad.	Member	
14	Mr. N. Bhargav Krishna	Assistant Professor	VMTW, Hyderabad.	Member	

MINUTES BOOK

Vignan's Institute of Management & Technology for Women (An Autonomous Institutions & Accredited by NBA & NAAC)

Department of Computer Science and Engineering (AI&ML)

Minutes of the 3rd Board of Studies (BoS) meeting held on 9th January 2026, 12:30 PM at Seminar Hall, B-Block, VMTW.

The Quorum (minimum 40%) was satisfied.

The Chairman-BOS, Dr. M Vishnu Vardhana Rao introduced the following members in the Board.

S. No.	Name	Designation	Organization	Position in BoS
1	Dr. M Vishnu Vardhana Rao	Associate Professor & HOD	VMTW, Hyderabad.	Chairman
2	Dr. Ch. Asha Jyothi	Associate Professor	JNTUH, Wanaparthy	Member (JNTUH Nominee)
3	Dr. P. Madhuravani	Senior Consultant	Centroid IT Systems, Hyderabad.	Member (Industry)
4	Dr. B. Vasavi	Assistant Professor	MVSR College, Hyderabad.	Member (Academician)
5	Dr. Killi Prakasa Rao	Assistant Professor	NIT, Warangal.	Member (Academician)
6	Ms. R. Sindhura	Jr. Technical Content Engineer	Tutorials Point, Hyderabad.	Member (Alumni)
7	Dr. M. Thejovathi	Associate Professor	VMTW, Hyderabad.	Member
8	Mr. B. Balakrishna	Sr. Assistant Professor	VMTW, Hyderabad.	Member
9	Mr. D. Bikshalu	Associate Professor	VMTW, Hyderabad.	Member
10	Mr. S. Jayanna	Assistant Professor	VMTW, Hyderabad.	Member
11	Mrs. V. Rupa	Assistant Professor	VMTW, Hyderabad.	Member
12	Mr. S. Sandeep Babu	Assistant Professor	VMTW, Hyderabad.	Member
13	Mrs. Ch. Swapna	Assistant Professor	VMTW, Hyderabad.	Member
14	Mr. N. Bhargav Krishna	Assistant Professor	VMTW, Hyderabad.	Member

Minutes of the Board of Studies (BOS) meeting held on Friday, 9th January 2026

The following members were present:

1. Dr. M. Vishnu Vardhana Rao
2. Dr. Ch. Asha Jyothi
3. Dr. P. Madhuravani
4. Dr. B. Vasavi
5. Dr. Killi Prakasa Rao
6. Ms. R. Sindhura
7. Dr. M. Thejovathi
8. Mr. B. Balakrishna
9. Mr. D. Bikshalu
10. Mr. S. Jayanna
11. Mrs. V. Rupa
12. Mr. S. Sandeep Babu
13. Mrs. Ch. Swapna
14. Mr. N. Bhargav Krishna

The Chairman-BOS welcomed all the members to the meeting of the Board of Studies.

Proceedings of the meeting of the Board of Studies

1.0 Review and Confirmation of Items

1.1 Review and confirmation of the Minutes of Meeting of the 2nd BoS held on 18th August 2025.

The Chairman-BOS Presented the Minutes of Meeting of the 2nd BoS held on 18th August 2025(Annexure-I). The board has reviewed and confirmed noted the points from the minutes of the Meeting held on 18th August 2025.

2.0 Approval Items

2.1 Approval of VR25-II B. Tech I & II Semester Course Structure.

The Chairman-BoS presented the VR25-II B. Tech I & II Semester Course Structure (attached here with Annexure -II) to the BoS members.

The Board has reviewed and confirmed the VR25-II B. Tech I & II Semester Course Structure.

2.2 Approval of Syllabus for VR25-II B. Tech I Semester.

The Chairman-BoS presented the Syllabus for VR25-II B. Tech I Semester (attached here with Annexure -III) to the BoS members.

The Board has reviewed and confirmed the VR25-II B. Tech I Semester Syllabus.

2.3 Approval of Syllabus for VR25-II B. Tech II Semester.

The Chairman-BoS presented the Syllabus for VR25-II B. Tech II Semester (attached here with Annexure -IV) to the BoS members.

The Board has reviewed and confirmed the VR25-II B. Tech II Semester Syllabus.

2.4 Approval of B. Tech Syllabus to the other departments for VR25.

The Chairman-BoS presented the Syllabus offering to other departments for VR25-II B. Tech I and II Semester (attached here with Annexure -V) to the BoS members as shown in below.

S. No.	Regulation	Year & Sem	Subject Name	Department
1	VR25	II-I	Node JS/React JS/Django	CSE, CSE(DS)
2	VR25	II-II	Machine Learning	CSE, CSE(DS)
3	VR25	II-II	Machine Learning Lab	CSE, CSE(DS)
4	VR25	II-II	Node JS/React JS/Django, UI Design – Flutter	IT

The Board has reviewed and confirmed the VR25-II B. Tech I & II Semester Syllabus.

2.5 Approval of VR24-III B. Tech I & II Semesters Course Structure

The Chairman-BoS presented the VR24-III B. Tech I & II Semesters Course Structure (attached here with Annexure -VI) to the BoS members.

The Board has reviewed and confirmed the VR24-III B. Tech I & II Semester Course Structure.

2.6 Approval of VR24-IV B. Tech I & II Semesters Course Structure.

The Chairman-BoS presented the VR24-IV B. Tech I & II Semesters Course Structure (attached here with Annexure -VII) to the BoS members.

The Board has reviewed and confirmed the VR24-IV B. Tech I & II Semesters Course Structure.

2.7 Approval of Syllabus for VR24-III B. Tech I & II Semesters.

The Chairman-BoS presented the Syllabus for VR24-III B. Tech I & II Semesters (attached here with Annexure -VIII) from the Academic Year 2025-2026 to the BoS members.

The Board has reviewed and confirmed the VR24-III B. Tech I & II Semesters Syllabus

2.8 Approval of Syllabus for VR24-IV B. Tech I & II Semesters.

The Chairman-BoS presented the Syllabus for VR24-IV B. Tech I & II Semesters (attached here with Annexure -IX) from the Academic Year 2025-2026 to the BoS members.

The Board has reviewed and confirmed the VR24-IV B. Tech I & II Semesters Syllabus.

2.9 Approval of B. Tech Syllabus to the other departments for VR24

The Chairman-BoS presented the Syllabus offering to other departments for the VR24-III B. Tech I & II Semesters (attached here with Annexure -X) to the BoS members as shown in below.

S.No.	Regulation	Year & Sem	Subject Name	Department
1	VR24	III-I	UI design- Flutter	CSE, IT
2	VR24	III-I	Machine Learning	IT
3	VR24	III-I	Machine Learning Lab	IT
4	VR24	III-II	Machine Learning	CSE, CSE(DS)
5	VR24	III-II	Artificial Intelligence	CSE
6	VR24	III-II	Machine Learning Lab	CSE, CSE(DS)
7	VR24	III-II	Artificial Intelligence Lab	CSE
8	VR24	IV-II	Artificial Intelligence (PE-V)	ECE
9	VR24	IV-II	Machine Learning (PE-V)	ECE

The Board has reviewed and confirmed the VR24-III B. Tech I & II Semesters Syllabus.

3.0 Any other item with the permission of the Chair

1. **Dr. P. Madhuravani**, Senior Consultant Centroid IT Systems, Hyderabad., recommended incorporating concepts of Python into Machine Learning Lab curriculum.
2. **Dr.Ch. Asha Jyothi**, Assistant Professor, JNTU, Wanaparthy approved for adopted R25 Artificial Intelligence added curriculum.
3. **Dr. Killi Prakasa Rao**, Assistant Professor, NITW, approved added few case studies in Machine Learning Lab.
4. **Dr. M. Thejovathi**, Associate Professor, VMTW, Hyderabad, approved added for Extra UI-Design-Flutter sample programs .
5. **Ms. R. Sindhura**, Software Engineer, Tutorial Point, asked whether the theory units align with lab experiments. The Chairman-BOS confirmed that the mapping is done according to the units.

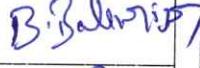
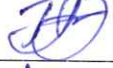
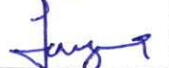
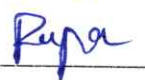
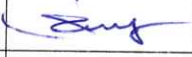
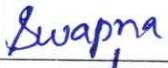
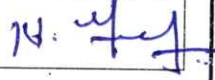
The Board suggested that the Chairman-BOS to maintain academic quality and update the syllabus to uphold the institution's standards.


Dr. M Vishnu Vardhana Rao
Chairman - BOS

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Department of Computer Science and Engineering (AI&ML)

**Minutes of the 3rd Board of Studies (BoS) meeting held on 9th January 2026, 12:30 PM
at Seminar Hall, B-Block, VMTW.**

S. No.	Name	Designation	Organization	Position in BoS	Signature
1	Dr. M Vishnu Vardhana Rao	Associate Professor & HOD	VMTW, Hyderabad.	Chairman	
2	Dr. Ch. Asha Jyothi	Associate Professor	JNTUH, Wanaparthy	Member (JNTUH Nominee)	
3	Dr. P. Madhuravani	Senior Consultant	Centroid IT Systems, Hyderabad.	Member (Industry)	
4	Dr. B. Vasavi	Assistant Professor	MVSR College, Hyderabad.	Member (Academician)	
5	Dr. Killi Prakasa Rao	Assistant Professor	NIT, Warangal.	Member (Academician)	
6	Ms. R. Sindhura	Jr. Technical Content Engineer	Tutorials Point, Hyderabad.	Member (Alumni)	
7	Dr. M. Thejovathi	Associate Professor	VMTW, Hyderabad.	Member	
8	Mr. B. Balakrishna	Assistant Professor	VMTW, Hyderabad.	Member	
9	Mr. D. Bikshalu	Assistant Professor	VMTW, Hyderabad.	Member	
10	Mr. S. Jayanna	Assistant Professor	VMTW, Hyderabad.	Member	
11	Mrs. V. Rupa	Assistant Professor	VMTW, Hyderabad.	Member	
12	Mr. S. Sandeep Babu	Assistant Professor	VMTW, Hyderabad.	Member	
13	Mrs. Ch. Swapna	Assistant Professor	VMTW, Hyderabad.	Member	
14	Mr. N. Bhargav Krishna	Assistant Professor	VMTW, Hyderabad.	Member	

Minutes of the Board of Studies (BOS) meeting held on Friday, 9th January 2026

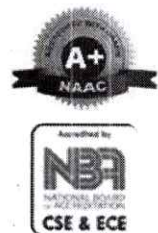


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Department of Computer Science and Engineering (AI&ML)

3rd. BoS Meeting on 9th January 2026

Members Present:

S. No.	Name	Designation	Organization	Position in BoS	Signature
1	Dr. M. Vishnu Vardhana Rao	Associate Professor & HOD	VMTW, Hyderabad.	Chairman	
2	Dr. Ch. Asha Jyothi	Associate Professor	JNTUH, Wanaparthi	Member (JNTUH Nominee)	
3	Dr. P. Madhuravani	Senior Consultant	Centroid IT Systems, Hyderabad.	Member (Industry)	
4	Dr. B. Vasavi	Assistant Professor	MVSR College, Hyderabad.	Member (Academician)	
5	Dr. Killi Prakasa Rao	Assistant Professor	NIT, Warangal.	Member (Academician)	
6	Ms. R. Sindhura	Jr. Technical Content Engineer	Tutorials Point, Hyderabad.	Member (Alumni)	
7	Dr. M. Thejovathi	Associate Professor	VMTW, Hyderabad.	Member	
8	Mr. B. Balakrishna	Assistant Professor	VMTW, Hyderabad.	Member	
9	Mr. D. Bikshalu	Associate Professor	VMTW, Hyderabad.	Member	
10	Mr. S. Jayanna	Assistant Professor	VMTW, Hyderabad.	Member	
11	Mrs. V. Rupa	Assistant Professor	VMTW, Hyderabad.	Member	
12	Mr. S. Sandeep Babu	Assistant Professor	VMTW, Hyderabad.	Member	
13	Mrs. Ch. Swapna	Assistant Professor	VMTW, Hyderabad.	Member	
14	Mr. N. Bhargav Krishna	Assistant Professor	VMTW, Hyderabad.	Member	

Annexure-I

MINUTES BOOK

Vignan's Institute of Management & Technology for Women (An Autonomous Institutions & Accredited by NBA & NAAC)

Department of Computer Science and Engineering (AI&ML)

Minutes of the 2nd Board of Studies (BoS) meeting held on 18th August 2025, 03:00 PM at Seminar Hall, B-Block, VMTW.

The Chairman-BOS, Dr. M. Vishnu Vardhana Rao introduced the following members in the Board.

The following members were present:

- 1 Dr. M. Vishnu Vardhana Rao
- 2 Dr. Ch. Asha Jyothi
- 3 Dr. P. Madhuravani
- 4 Dr. B. Vasavi
- 5 Dr. Killi Prakasa Rao
- 6 Ms. R. Sindhura
- 7 Dr. M. Thejovathi
- 8 Mr. B. Balakrishna
- 9 Mr. D. Bikshalu
- 10 Mr. S. Jayanna
- 11 Mrs. V. Rupa
- 12 Mr. S. Sandeep Babu
- 13 Mrs. Ch. Swapna
- 14 Mr. N. Bhargav Krishna

The Chairman-BOS welcomed all the members to the meeting of the Board of Studies.

Proceedings of the meeting of the Board of Studies

1.0 Review and Confirmation of Items.

1.1 Review and confirmation of the Minutes of Meeting of the 1st BoS held on 19th December 2024.

The minutes of the previous meeting were presented before the members.

The Board has confirmed 1st BoS Minutes of Meeting.

1.2 Review and Confirmation of I B. Tech CSE (AI & ML) Course Structure (VR25) from the A.Y: 2025-26.

The Chairman presented the I B. Tech CSE (AI & ML) Course Structure (VR25) from the A.Y. 2025-26.

The Board has approved the I B. Tech CSE (AI & ML) Course Structure (VR25) from the A.Y: 2025-26. **(Annexure-I).**

1.3 Review and Confirmation of Academic Regulation VR25 from the A.Y: 2025-26

The Chairman presented the Academic Regulation VR25 from the A.Y. 2025-26.

The Board has Reviewed and Confirmation of Academic Regulation VR25 from the A.Y: 2025-26(Annexure-II).

2.0 Approval Items.

2.1 Approval of Syllabus for I B. Tech I & II Semester.

The Chairman-BoS presented the Syllabus offering to other departments for the VR25 I B. Tech I & II Semesters.

S. No.	Regulation	Year & Sem	Subject Name	Department
1	VR25	I-I	Python Programming Lab	IT
2	VR25	I-II	Python Programming Lab	CSE, CSE(AI&ML), CSE(DS)
3	VR25	I-II	Python Programming	ECE
4	VR25	I-II	Applied Python Programming Lab	ECE

The Board has approved the Syllabus for I B. Tech I & II Semester. (Annexure-III)

3.0 Any other item with the permission of the Chair

1. Dr. P. Madhuravani, Sr. Consultant, Centroid IT, recommended incorporating concepts of data structures into the Python curriculum.
2. Dr. Asha Jyothi, Assistant Professor, JNTU, Wanaparthy approved added few case studies in Python Programming Lab.
3. Dr. Killi Prakasa Rao, Assistant Professor, NITW, approved added few cases studies in Python Programming Lab.
4. Ms. R. Sindhura, Software Engineer, Tutorial Point, asked whether the theory units align with lab experiments.

The Chairman-BOS confirmed that the mapping is done according to the units. The Board suggested that the Chairman-BOS to maintain academic quality and update the syllabus to uphold the institution's standards.

The Chairperson thanked all members for their valuable inputs and active participation. The meeting concluded with a note of appreciation to the Chair.



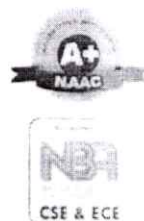
Dr. M Vishnu Vardhana Rao
Chairman - BOS



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Department of Computer Science and Engineering (AI&ML)

2nd BoS Meeting on 18th August 2025

Members Present:

S. No.	Name	Designation	Organization	Position in BoS	Signature
1	Dr. M. Vishnu Vardhana Rao	Associate Professor & HOD	VMTW, Hyderabad.	Chairman	M. Vardhana Rao
2	Dr. Ch. Asha Jyothi	Associate Professor	JNTUH, Wanaparthy	Member (JNTUH Nominee)	Ch. Asha Jyothi
3	Dr. P. Madhuravani	Senior Consultant	Centroid IT Systems, Hyd.	Member (Academician)	P. Madhuravani
4	Dr. B. Vasavi	Assistant Professor	MVSR Engg College, Hyderabad.	Member (Academician)	B. Vasavi
5	Dr. Killi Prakasa Rao	Assistant Professor	NIT, Warangal.	Member (Industry)	K. Prakasa Rao
6	Ms. R. Sindhura	Jr. Technical Content Engineer	Tutorials Point, Hyderabad.	Member (Alumni)	R. Sindhura
7	Dr. M. Thejovathi	Associate Professor	VMTW, Hyderabad.	Member	M. Thejovathi
8	Mr. B. Balakrishna	Assistant Professor	VMTW, Hyderabad.	Member	B. Balakrishna
9	Mr. D. Bikshalu	Associate Professor	VMTW, Hyderabad.	Member	D. Bikshalu
10	Mr. S. Jayanna	Assistant Professor	VMTW, Hyderabad.	Member	S. Jayanna
11	Mrs. V. Rupa	Assistant Professor	VMTW, Hyderabad.	Member	V. Rupa
12	Mr. S. Sandeep Babu	Assistant Professor	VMTW, Hyderabad.	Member	S. Sandeep Babu
13	Mrs. Ch. Swapna	Assistant Professor	VMTW, Hyderabad.	Member	Ch. Swapna
14	Mr. N. Bhargav Krishna	Assistant Professor	VMTW, Hyderabad.	Member	N. Bhargav Krishna

Vignan's Institute of Management & Technology for Women
(An Autonomous Institutions& Accredited by NBA & NAAC)

Department of Computer Science and Engineering (AI&ML)

**Minutes of the 2ndBoard of Studies (BoS) meeting held on 18th August 2025, 03:00 PM
at Seminar Hall, B-Block, VMTW.**

S. No.	Name	Designation	Organization	Position in BoS
1	Dr. M. Vishnu Vardhana Rao	Associate Professor & HOD	VMTW, Hyderabad.	Chairman
2	Dr. Ch. Asha Jyothi	Associate Professor	JNTUH, Wanaparthy	Member (JNTUH Nominee)
3	Dr. P. Madhuravani	Senior Consultant	Centroid IT Systems, Hyd.	Member (Industry)
4	Dr. B. Vasavi	Assistant Professor	MVSR Engg College, Hyderabad.	Member (Academician)
5	Dr. Killi Prakasa Rao	Assistant Professor	NIT, Warangal.	Member (Academician)
6	Ms. R. Sindhura	Jr. Technical Content Engineer	Tutorials Point, Hyderabad.	Member (Alumni)
7	Dr. M. Thejovathi	Associate Professor	VMTW, Hyderabad.	Member
8	Mr. B. Balakrishna	Assistant Professor	VMTW, Hyderabad.	Member
9	Mr. D. Bikshalu	Associate Professor	VMTW, Hyderabad.	Member
10	Mr. S. Jayanna	Assistant Professor	VMTW, Hyderabad.	Member
11	Mrs. V. Rupa	Assistant Professor	VMTW, Hyderabad.	Member
12	Mr. S. Sandeep Babu	Assistant Professor	VMTW, Hyderabad.	Member
13	Mrs. Ch. Swapna	Assistant Professor	VMTW, Hyderabad.	Member
14	Mr. N. Bhargav Krishna	Assistant Professor	VMTW, Hyderabad.	Member

Annexure-II

VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN
B. Tech. in CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)
COURSE STRUCTURE – VR25

II B. Tech. – I Semester

S.No	Course Code	Course	L	T	P	Credits
1	25MA301BS	Mathematical and Statistical Foundations	3	0	0	3
2	25EC302PC	Computer Organization and Architecture	3	0	0	3
3	25CS303PC	Object Oriented Programming through Java	3	0	0	3
4	25IT304PC	Software Engineering	3	0	0	3
5	25CS305PC	Database Management System	3	0	0	3
6	25MA306PC	Computational Mathematics Lab	0	0	2	1
7	25CS307PC	Object Oriented Programming through Java Lab	0	0	2	1
8	25IT308PC	Software Engineering Lab	0	0	2	1
9	25CS309PC	Database Management Systems Lab	0	0	2	1
10	25ML310SD	Node JS/React JS/Django	0	0	2	1
Total			15	0	10	20

II B. Tech. - II Semester

S.No	Course Code	Course	L	T	P	Credits
1	25CS401PC	Discrete Mathematics	3	0	0	3
2	25CS402PC	Operating Systems	3	0	0	3
3	25DS403PC	Algorithms Design and Analysis	3	0	0	3
4	25CS404PC	Computer Networks	3	0	0	3
5	25ML405PC	Machine Learning	3	0	0	3
6	25MS406BS	Innovation and Entrepreneurship	2	0	0	2
7	25CS407PC	Operating Systems Lab	0	0	2	1
8	25CS408PC	Computer Networks lab	0	0	2	1
9	25ML409PC	Machine Learning Lab	0	0	2	1
10	25DS410SD	Data Visualization- R Programming/ Power BI	0	0	2	1
11	25MS411BS	Indian Knowledge System	1	0	0	1
Total			18	0	08	22

Note: L - Theory

T - Tutorial

P - Practical

C - Credits

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Annexure-III

B.Tech.

L T P C

II Year - I Semester

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MATHEMATICAL AND STATISTICAL FOUNDATIONS

(Common for IT, CSE(AI&ML) & CSE(Data Science))

Course Objectives:

- To learn the Number Theory basic concepts useful for cryptography etc.
- To learn the theory of Probability, and probability distributions of single random variables.
- To learn the sampling theory and testing of hypothesis and making inferences.
- The curve fitting, correlation and regression for the given data. the fundamentals of computers.

Course Outcomes: The student will learn

- To apply fundamental concepts of number theory, including GCD, prime factorization, and the Euclidean algorithm, to solve problems involving linear congruences.
- To compute and analyze the mean and variance of discrete random variables using Binomial and Poisson distributions in real-world contexts.
- Apply properties of the normal distribution and the Central Limit Theorem to analyze sampling distributions and solve practical probability problems.
- Analyze and evaluate statistical hypotheses for large and small samples to draw valid conclusions about means, proportions, and variances.
- Apply least squares and regression techniques to model data relationships and evaluate non-parametric associations using rank correlation methods.

UNIT-I: Basics of Number Theory

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Greatest Common Divisors and Prime Factorization: Greatest common divisors – The Euclidean algorithm – The fundamental theorem of arithmetic – Factorization of integers and the Fermat numbers. Congruences: Introduction to congruences – Linear congruences.

UNIT-II: Random Variables and Probability Distributions

8 L

Concept of a Random Variable – Discrete Probability Distributions – Continuous Probability Distributions – Mean of a Random Variable – Variance of a Random Variable
Discrete Probability Distributions: Binomial Distribution – Poisson distribution

UNIT-III: Continuous Distributions and Sampling

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Uniform Distribution – Normal Distribution – Areas under the Normal Curve – Applications of the Normal Distribution – Normal Approximation to the Binomial Distributions. Fundamental Sampling Distributions: Random Sampling – Some Important Statistics – Sampling Distributions – Sampling Distribution of Means – Central Limit Theorem.

UNIT-IV: Tests of Hypotheses (Large and Small Samples)

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Statistical Hypotheses: General Concepts – Testing a Statistical Hypothesis. Single sample: Tests concerning a single mean. Two samples: Tests on two mean (Unknown for equal variance). One sample: Test on a single proportion. Two samples: Tests on two proportions. Two- sample tests concerning variances: F-distribution

1) Q10A 2) Q10B 3) Q10C 4) Q10D

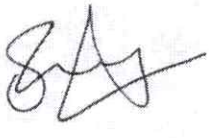
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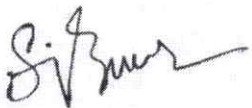
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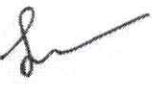
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UNIT-V: Applied Statistics

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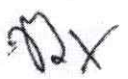
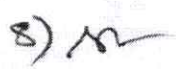
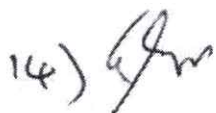
Curve fitting by the method of least squares – Fitting of straight lines – Second degree parabolas and more general curves – Correlation and Regression – Rank correlation.

Text Books:

1. **Kenneth H. Rosen**, Elementary Number Theory & its Applications, sixth edition, Addison Wesley, ISBN 978 0-321-50031-1.
2. **Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye**, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. **S C Gupta and V K Kapoor**, Fundamentals of Mathematical Statistics, Khanna publications.

Reference Books:

1. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.

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B.Tech.ECE

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II Year-I Semester

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COMPUTER ORGANIZATION AND ARCHITECTURE
(common for CSE ,AIML&DS)

Prerequisites: No prerequisites.

Co-requisite: A Course on "Digital Electronics".

Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Course Outcomes:

- Understand the basics of instruction sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers

UNIT-I :

Boolean Algebra and Logic Gates: Binary codes, Binary Storage and Registers, Binary logic.

Digital logic gates. Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

UNIT-II: Combinational Logic

Combinational Circuits, Analysis procedure Design procedure, Binary Adder Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.

Sequential Logic: Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure. Registers, shift Registers, Ripple counters, synchronous counters, other counters.

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UNIT-III: Register Transfer Language and Micro operations

Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro-operations, shift micro-operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT-IV: Microprogrammed Control

Control memory, Address sequencing, micro program example, design of control unit. Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control..

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-V: Input-Output Organization

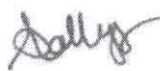
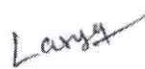
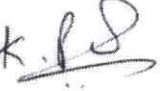
Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Text Books:

1. Digital Design – M. Morris Mano, Third Edition, Pearson/PHI.
2. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI..

Reference Books:

1. Switching and Finite Automata Theory, ZVI. Kohavi, Tata Mc Graw Hill.
2. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

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B.Tech. L T P C
II Year - I Semester 3 0 0 3

OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Common for CSE, IT, CSE(AI&ML), CSE(DS))

Course Objectives:

- To Understand the basic object-oriented programming concepts and apply them in problem solving.
- To Illustrate inheritance concepts for reusing the program.
- To Demonstrate multitasking by using multiple threads and event handling
- To Develop data-centric applications using JDBC.
- To Understand the basics of java console and GUI based programming

Course Outcomes: The student will learn

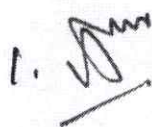
- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server.

UNIT - I:

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring String class.

UNIT - II:

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super keyword uses, using final keyword with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

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UNIT - III:

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.

UNIT - IV:

Exploring String class, Object class, Exploring java.util package, Exploring java.io package Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT - V:

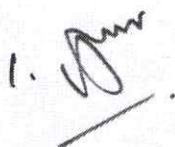
Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing JFrame and JComponent, JLabel, ImageIcon, JTextField, JButton, JCheckBox, JRadioButton, JList, JComboBox, Tabbed Panes, Scroll Panes, Trees, and Tables. Menu Basics, Menu related classes - JMenuBar, JMenu, JMenuItem, JCheckBoxMenuItem, JRadioButtonMenuItem, JSeparator. creating a popup menu

Text Books:

1. Java the complete reference, 13th edition, Herbert schildt, Dr. Denny Coward, Mc Graw Hill.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programing, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
9. Maurach's Beginning Java2 JDK 5, SPD.

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B.Tech.

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II Year - I Semester

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SOFTWARE ENGINEERING
(Common for CSE, CSE(AI&ML), CSE(DS))

Course Objectives:

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes: The student will learn

- Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD)
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
- Translate end-user requirements into system and software requirements using techniques such as UML and document them in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and design patterns to perform high-level system design and critically compare alternative design choices.
- Understand software testing challenges and develop a basic software testing report demonstrating knowledge of testing techniques

UNIT - I:

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI).

Process models: The waterfall model, Spiral model and Agile methodology

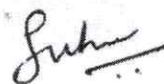
UNIT - II:

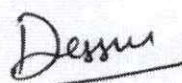
Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management

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UNIT - III:

Design Engineering: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT - IV:

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT - V:

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Textbooks:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill, International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

Reference Books:

1. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

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B.Tech. - CEE

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II Year - I Semester

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DATABASE MANAGEMENT SYSTEMS
(Common for CSE, CSE(ATML), CSE(CS))

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes: The student will learn

- Gain knowledge of fundamentals of DBMS, database design and normal forms.
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

UNIT - I:

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS Introduction to **Database Design:** Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II:

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III:

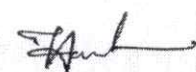
SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

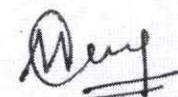
Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multivalued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV:

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent

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Transactions.

UNIT - V:

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:

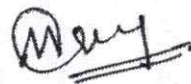
1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition. 3rd Edition
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

Reference Books:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI. 6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

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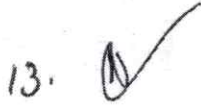
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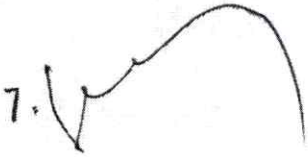
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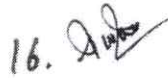
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B.Tech.

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II Year - I Semester

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Computational Mathematics Lab
(Common for IT, CSE(AI&ML) & CSE (Data Science))

Course Objectives:

- To Solve problems of Eigen values and Eigen Vectors using Python/MATLAB.
- To Solve Algebraic and Transcendental Equations using Python/MATLAB
- To Solve problems of Linear system of equations
- To Solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients.
- To Solve problems of Applied Statistics

Course Outcomes: The student will learn

- Calculate eigenvalues and eigenvectors of matrices and construct their geometric representations to explain how linear transformations scale and rotate vectors.
- Apply bracketing and open numerical methods to locate roots of nonlinear equations and illustrate the step-by-step convergence behavior graphically.
- Execute iterative algorithms for linear systems and analyze the rate of convergence by comparing graphical residuals between Jacobi and Gauss-Seidel methods.
- Model real-world physical systems use ordinary differential equations and evaluate their behavior through numerical solution plots (e.g., population growth or cooling).
- Appraise experimental data by deriving best-fit curves and correlation coefficients to quantify and visualize the strength of relationships between variables.

Visualize all solutions Graphically through programmes

UNIT - I: Eigen values and Eigenvectors:

6P

Programs:

- Finding real and complex Eigen values.
- Finding Eigen vectors.

UNIT-II: Solution of Algebraic and Transcendental Equations

6P

Bisection method, Newton Raphson Method

Programs:

- Root of a given equation using Bisection method.
- Root of a given equation Newton Raphson Method.

UNIT-III: Linear system of equations:

6P

Jacobi's iteration method and Gauss-Seidel iteration method

Programs:

- Solution of given system of linear equations using Jacobi's method
- Solution of given system of linear equations using Gauss-Seidel method

UNIT-IV: First-Order ODEs & Higher order LDE with constant coefficients

12P

Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling.

Programs:

- Solving exact and non-exact equations

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6) ~~Rm~~

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- Solving exponential growth/decay and Newton's law of cooling problems
- Solving homogeneous ODEs
- Solving non-homogeneous ODEs

UNIT-V: Applied Statistics

6P

Programs:

Curve Fitting – Straight Line & Second-Degree Curve

Karl Pearson's Correlation Coefficient

Regression Lines y on x & x on y

Spearman's Rank Correlation (With & Without Ties)

Combined Statistical Analysis

Textbooks:

1. MATLAB and its Applications in Engineering, **Rajkumar Basal, Ashok Kumar Geo, Manoj Kumar Sharma**, Pearson publication.
2. **Kenneth A. Lambert**, The fundamentals of Python: First Programs, 2011, Cengage Learnings.
3. Think Python First Edition, by **Allen B. Downey**, Orielly publishing.
4. Introduction to Python Programming, **William Mitchell, Povel Solin, Martin Novak et al.**, NCLab Public Computing, 2012.
5. Introduction to Python Programming, ©**Jacob Fredslund**, 2007.

Reference Books:

1. An Introduction to Python, John C. Luth, The University of Alabama, 2011.
2. Introduction to Python, ©**Dave Kuhlman**, 2008.

Minimum Requirement of Software & Hardware:

Computer Systems with Python/Scilab/MATLAB installed

1) 2) 3) 4)

5) 6) 7) 8)

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25CS307PC

Vignan's Institute of Management and Technology for Women
An Autonomous Institution

VR25

B.Tech.

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II Year - I Semester

0 0 2 1

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB
(Common for CSE, CSE(AI&ML), CSE(DS))

Course Objectives:

- To write programs using abstract classes.
- To write programs for solving real world problems using the java collection framework.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands-on experience with java programming.

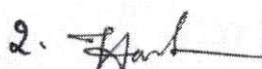
Course Outcomes: The student will learn

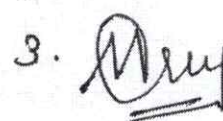
- Able to write programs for solving real world problems using the java collection framework.
- Able to write programs using abstract classes.
- Able to write multithreaded programs.
- Able to write GUI programs using swing controls in Java

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project. add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. A) Develop an applet in Java that displays a simple message.
B) Develop an applet in Java that receives an integer in one text field, and computes its factorial
4. Value and returns it in another text field, when the button named "Compute" is clicked.
5. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.
6. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

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7. Write a Java program for the following:
Create a doubly linked list of elements.
Delete a given element from the above list.
Display the contents of the list after deletion.
8. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in the selected color. Initially, there is no message shown.
9. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
10. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas.
11. Write a java program to display the table using Labels in Grid Layout.
12. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
13. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
14. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.
15. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

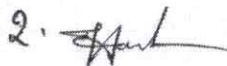
Text Books:

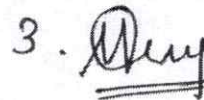
1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.

Reference Books:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph. P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill Publishing co.

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4. Wahid

11. Raf

5. Ramul

12. R

6. Lasya

13. R

7. S

14. B. G. G.

8. Faimel

15. B. G. G.

9. R. G.

16. R. G.

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B.Tech.

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II Year - I Semester

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SOFTWARE ENGINEERING LAB
(Common for CSE, CSE(AI&ML), CSE(DS))

Course Objectives:

- To have hands-on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.
- To understand the working principle of various communication protocols.

Course Outcomes: The student will learn

- Ability to translate end-user requirements into system and software requirements
- Ability to generate a high-level design of the system from the software requirements
- Implement data link layer farming methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.

Software Engineering

List of Experiments:

Do the following seven exercises for any two projects given in the list of sample projects or any other

Projects:

1. Development of problem statements.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related Documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

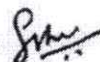
1. Passport automation System
2. Book Bank
3. Online Exam Registration.

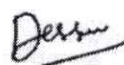
Case Studies:

1. Online Ticket Booking system
2. Library Management System

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6. A. Sy

7. Helini

8. Rupa

9. Sely

10. Jeying

11. Puf

12. Supps

13. Lay

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B.Tech. - CSE

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II Year - I Semester

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DATABASE MANAGEMENT SYSTEMS LAB
(Common for CSE, CSE (ATML), CSE (DS))

Course Objectives:

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes: The student will learn

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A) Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.) B) Nested, Correlated sub queries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

Text Books:

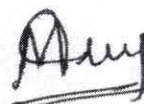
- 1.Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
- 2.Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition

Reference Books:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

1. 

2. 

3. 

4. Vijay

5. Ramesh

6. Lasya

7. Sanjay

8. Tarun

9. Prasanna

10. Anand

11. Raj

12. Sudhakar

13. Aravind

14. B. Gautham

15. Rohith

16. Adarsh

B.Tech	L	T	P	C
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NODE JS/ REACT JS/ DJANGO
(Common to CSE, CSE(AI&ML),CSE (DS))

Course Objectives:

1. To implement the static web pages using HTML and do client-side validation using JavaScript.
2. To design and work with databases using Java
3. To develop an end to end application using java full stack.
4. To introduce Node JS implementation for server-side programming.
5. To experiment with single page application development using React.

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

1. Build a custom website with HTML, CSS, Bootstrap and little JavaScript.
2. Demonstrate Advanced features of JavaScript and learn about JDBC 3.
Develop Server – side implementation using Java technologies like
4. Develop the server – side implementation using Node JS.
5. Design a Single Page Application using React.

Exercises:

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)

1. Mee Rao

2. Vitha

3. Ishi

11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into GitHub.

Reference Books:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010.
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node ,2nd Edition, APress.

1. Murugan

2. Visha

3. Vishu

4. Vasari

5. K. Bakem

6. Re Sindhu

7. Shrey

8. B. Bakem

9. JD

10. Suraj

11. Rupa

12. Suraj

13. Swarna

14. N. Suraj

Annexure-III

Approval of Syllabus of CSE(AI&ML) department for VR25-II B. Tech I Semester.

S.No.	Regulation	Year & Sem	Subject Name	Department
1	VR25	II-I	NODE JS/ REACT JS/ DJANGO	CSE, CSE(AI&ML), CSE(DS)

B.Tech

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II Year - I Semester

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NODE JS/ REACT JS/ DJANGO
(Common to CSE, CSE(AI&ML), CSE (DS))

Course Objectives:

1. To implement the static web pages using HTML and do client-side validation using JavaScript.
2. To design and work with databases using Java
3. To develop an end to end application using java full stack.
4. To introduce Node JS implementation for server-side programming.
5. To experiment with single page application development using React.

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

1. Build a custom website with HTML, CSS, Bootstrap and little JavaScript.
2. Demonstrate Advanced features of JavaScript and learn about JDBC 3.
Develop Server – side implementation using Java technologies like
4. Develop the server – side implementation using Node JS.
5. Design a Single Page Application using React.

Exercises:

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)

1. M. Ravi

2. V. Ravi

3. V. Ravi

11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into GitHub.

Reference Books:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010.
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node ,2nd Edition, APress.

1. MueR

2. Basha

3. Vas

4. Vasari

5. K. Baker

6. Re Sindhu

7. Shrey

8. B. Baker

9. JD

10. Suraj

11. Rupa

12. Amey

13. Swarna

14. N. Jyoti

Annexure-IV

VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN
B. Tech. in CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)
COURSE STRUCTURE – VR25

II B. Tech. – I Semester

S.No	Course Code	Course	L	T	P	Credits
1	25MA301BS	Mathematical and Statistical Foundations	3	0	0	3
2	25EC302PC	Computer Organization and Architecture	3	0	0	3
3	25CS303PC	Object Oriented Programming through Java	3	0	0	3
4	25IT304PC	Software Engineering	3	0	0	3
5	25CS305PC	Database Management System	3	0	0	3
6	25MA306PC	Computational Mathematics Lab	0	0	2	1
7	25CS307PC	Object Oriented Programming through Java Lab	0	0	2	1
8	25IT308PC	Software Engineering Lab	0	0	2	1
9	25CS309PC	Database Management Systems Lab	0	0	2	1
10	25ML310SD	Node JS/React JS/Django	0	0	2	1
Total			15	0	10	20

II B. Tech. - II Semester

S.No	Course Code	Course	L	T	P	Credits
1	25CS401PC	Discrete Mathematics	3	0	0	3
2	25CS402PC	Operating Systems	3	0	0	3
3	25DS403PC	Algorithms Design and Analysis	3	0	0	3
4	25CS404PC	Computer Networks	3	0	0	3
5	25ML405PC	Machine Learning	3	0	0	3
6	25MS406BS	Innovation and Entrepreneurship	2	0	0	2
7	25CS407PC	Operating Systems Lab	0	0	2	1
8	25CS408PC	Computer Networks lab	0	0	2	1
9	25ML409PC	Machine Learning Lab	0	0	2	1
10	25DS410SD	Data Visualization- R Programming/ Power BI	0	0	2	1
11	25MS411BS	Indian Knowledge System	1	0	0	1
Total			18	0	08	22

Note: L - Theory

T - Tutorial

P - Practical

C - Credits

1. Meera R

2. V. V. V.

3. V. V. V.

4. V. V. V.

B.Tech. CSE

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II Year - II Semester

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DISCRETE MATHEMATICS
(Common for AIML, DS, IT)

Course Objectives:

- Introduces elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes: The student will learn

- Understand and construct precise mathematical proofs
- Apply logic and set theory to formulate precise statements
- Analyze and solve counting problems on finite and discrete structures
- Describe and manipulate sequences
- Apply graph theory in solving computing problems

UNIT - I: Mathematical logic:

Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II: Set theory:

Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT - III: Algebraic Structures:

Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

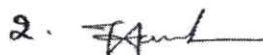
UNIT - IV: Elementary Combinatorics:

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT - V: Graph Theory:

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

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Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe I. Mott, Abraham Kandel, Theodore P. Baker, Prentis Hall of India, 2nd ed.

Reference Books:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph. P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill Publishing co.

4. Rajesh

11. Raj

5. Ramesh

12. Raj

6. Lasya

13. Raj

7. Raj

14. Raj

8. Rajesh

15. Rajesh

9. Raj

16. Raj

10. Raj

B.Tech.

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II Year - II Semester

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OPERATING SYSTEMS

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

Course Objectives:

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, inter process communication and I/O in Unix

Course Outcomes: The student will learn

- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computers and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT - I:

Operating System- Introduction, Structures - Simple Batch, Multi programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II:

CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec **Deadlocks** - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT - III:

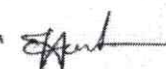
Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

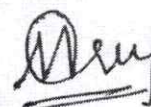
Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV:

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

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UNIT - V:

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

Text Books:

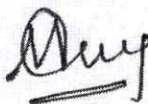
1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

Reference Books:

1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition-2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

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5. Ramish

13. A

6. Lasya

14. B. Gautha

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15. Rechno

8. Tramul

16. Sub

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B.Tech.

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II Year - II Semester

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ALGORITHMS DESIGN AND ANALYSIS
(Common for CSE(DS), CSE, CSE(AI&ML))

Course Objectives

- Develop proficiency in evaluating algorithms using asymptotic notations, including best-, average-, and worst-case time/space complexities, and solving related recurrence relations.
- Master various algorithmic strategies—divide-and-conquer, greedy, dynamic programming, backtracking, and branch-and-bound—identifying suitable use cases and demonstrating their application.
- Critically assess and contrast different algorithms in terms of efficiency, scalability, and correctness through rigorous analytical reasoning and empirical evaluation.
- Differentiate between tractable (polynomial-time) and intractable (super-polynomial or exponential-time) problems;
- **Identify and classify** problems as P, NP, NP-hard, or NP-complete, and assess their relationships through polynomial-time reductions and Cook's theorem.

Course Outcomes

- Able to Apply space and time complexity analysis using asymptotic notations.
- Able to Design divide-and-conquer algorithms and critically assess their runtime and space trade-offs.
- Able to Device backtracking and dynamic programming solutions.
- Able to Apply greedy methods and graph traversal algorithms
- Able to Analyse and Design branch-and-bound algorithms for NP-hard problems

UNIT - I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation, and Little oh notation.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue-Heaps, Heapsort **Backtracking:** General method, applications, n-queens problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

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UNIT - III

Dynamic Programming: General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT - IV

Greedy method: General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

UNIT - V

Branch and Bound: General method, applications - Travelling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni, and Rajasekaran, University Press.

REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman, and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and Sons.

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COMPUTER NETWORKS
(Common for CSE, CSE(AI&ML), CSE(DS))

Course Objectives:

- Equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.
- Elucidate the students about working and implementation of protocols at various layers in protocols stack.
- Appreciating the protocol working by observing and analysing outputs of the packet sniffer,

Course Outcomes: The student will learn

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the ISO-OSI and TCP/IP reference model.
- Obtain the skills of sub netting and routing mechanisms.
- Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.
- Understanding working of the protocols through traces captured by a packet sniffer

UNIT - I:

Introduction: The Internet, Protocol, Network Edge, Access Networks, Network Core, Packet Switching, Circuit Switching, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol reference models: ISO-OSI, TCP/IP, Types of Network attacks, History of Computer Networking and the Internet.

UNIT - II:

Application Layer: Principles of Network Applications, Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, SMTP, DNS, Peer-to-Peer Applications, Socket Programming: Creating Network Applications.

UNIT - III:

Transport Layer: Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N (GBN), Selective Repeat (SR), Connection-Oriented Transport: TCP, The TCP Connection, Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control, TCP Congestion Control, Fairness.

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UNIT - IV:

Network Layer: Data and Control plane, Forwarding and Routing 308, Network Service Models, Virtual Circuit and Datagram Networks, Router working, The Internet Protocol (IP): Forwarding and Addressing in the Internet, Datagram Format, IPv4 Addressing, Internet Control Message Protocol (ICMP), IPv6, IP Security, Routing Algorithms- The Link-State (LS) Routing Algorithm, The Distance Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet-Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter-AS Routing: BGP, Broadcast and Multicast Routing, Broadcast Routing Algorithms, Multicasting.

UNIT - V:

The Link Layer: The Services Provided by the Link Layer, Error-Detection and -Correction Techniques Parity Checks, Checksum Methods, Cyclic Redundancy Check (CRC), Hamming code, Multiple Access Links and Protocols, Channel Partitioning Protocols, Random Access Protocols, Taking-Turns Protocols, DOCSIS: The Link-Layer Protocol for Cable Internet Access, Switched Local Area Networks, Link-Layer Addressing and ARP, Ethernet, Link-Layer Switches, Virtual Local Area Networks (VLANs), Link Virtualization-Multiprotocol Label Switching (MPLS), Data Center Networking, A Day in the Life of a Web Page Request. Wireless network characteristics, Wireless LAN.

Text Books:

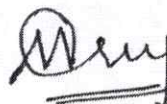
1. Computer Networking: A Top-Down Approach – James F. Kurose, Keith W. Ross, Pearson
2. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson/PHI

Reference Books:

1. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH

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II Year - II Semester

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MACHINE LEARNING

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

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To have a thorough understanding of the Supervised and Unsupervised learning techniques
3. To study the various probability-based learning techniques

Course Outcomes: The student will learn

1. Distinguish between, supervised, unsupervised and semi-supervised learning.
2. Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
3. Design an ensemble model to increase the classification accuracy
4. Understand the principles of RL evolutionary computing algorithms
5. Demonstrate teamwork, documentation, and communication in ML-based projects

UNIT - I:

Introduction to Machine Learning: Types of Human learning, machine learning process, Well-posed learning problem, Types of machine learning and comparison, applications of machine learning. Model Preparation, Evaluation and feature engineering: Machine learning activities, Types of data in machine learning, dataset understanding, plotting and exploration, checking data quality, remediation, data pre-processing, selecting a model, predictive and descriptive models, supervised learning model training, cross-validation and boot strapping, lazy vs eager learner, interpreting the model- underfitting, overfitting, bias-variance trade-off. Parameter for evaluating performance of classification, regression, and clustering model. Improving performance of a model.

UNIT - II:

Feature Engineering: Feature transformation - feature construction, feature extraction by PCA, SVD, LDA. Feature subset selection – feature relevancy and redundancy measures. Feature selection process and approaches.

Review of Probability concepts: joint probability, conditional probability, bayes rule, Common discrete and continuous distributions, dealing with multiple random variables, central limit theorem. Bayes classifier, Multi-class Classification, Naïve Bayes classifier, Bayesian belief network.

UNIT - III:

Supervised Learning - Introduction to supervised learning,

Regression: Introduction of regression, Regression algorithms: Simple linear regression, Multiple linear regression, Polynomial regression model, Logistic regression, Maximum

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likelihood estimation. Classification: Classification model and learning steps, Classification algorithms: Naïve Bayes classifier, Distance measures, k-Nearest Neighbor (kNN), Decision tree, Support vector machines, Kernel trick, Random Forest.

UNIT - IV:

Unsupervised Learning: Introduction to unsupervised learning, Unsupervised vs supervised learning, Application of unsupervised learning, Clustering and its types, Partitioning method: k-Means and KMedoids, Hierarchical clustering, Density-based methods – DBSCAN.

UNIT - V:

Artificial Neural Network: Biological neuron, Artificial neuron, Activation functions, neural network architecture, perceptron, learning process in ANN, Back propagation.

Introduction to deep learning, overview of reinforcement learning, Representation learning, Evolutionary learning. Case-study of ML applications: Image recognition, Email spam filtering, Online fraud detection.

Text Books:

1. Saikat Dutt, S. Chjandramouli, Das – Machine Learning, First Edition, Pearson
2. M N Murty, Anathanarayana V S – Machine Learning, First Edition, University Press
3. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.

Reference Books:

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition,
2. Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

1. Murthy
2. Baba
3. Chell
4. Vasari
5. K. Becker
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INNOVATION AND ENTREPRENEURSHIP

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

Course Objectives:

- To familiarize on the basic concepts of innovation, entrepreneurship and its importance.
- To Identify and analyze the process of problem-opportunity identification, market segmentation, and idea generation techniques.
- To initiate prototype development and understand minimum viable products.
- To develop initial Business and financial planning and Go-to-Market strategies.
- To impart knowledge on establishing startups, venture pitching and IPR.

Course Outcomes: The student will learn

- Understand the entrepreneurship and the entrepreneurial process and its significance in economic development.
- Assess the problem from an industry perspective and generate solutions using the design thinking principles.
- Assess market competition, estimate market size, and develop a prototype.
- Analyze Business and financial planning models and Go-to-Market strategies.
- Able to build a start-up, register IP and identify funding opportunities.

UNIT - I: Fundamentals of Innovation and Entrepreneurship

Innovation: Introduction, need for innovation, Features, Types of innovations, innovations in manufacturing and service sectors, fostering a culture of innovation, planning for innovation. Entrepreneurship: Introduction, types of entrepreneurship attributes, mindset of entrepreneurial and intrapreneurial leadership, Role of entrepreneurs in economic development. Woman Entrepreneurship, Importance of on-campus startups. Understanding to build entrepreneurial mindset, attributes and networks individuals while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity.

UNIT - II: Problem and Customer Identification:

Identification of gap, problem, analyzing the problem from a industry perspective, real-world problems, market and customer segmentation, validation of customer problem fit, Iterating problem-customer fit, Competition and Industry trends mapping and assessing initial opportunity, Porter's Five Force Model. Idea generation, Ideation techniques: Brainstorming, Brain writing, round robin, and SCAMPER, Design thinking principles, Mapping of solution to problem.

Core Teaching Tool: Several types of activities including Class, game, Gen AI, Get out of the building and Venture Activity.

UNIT - III: Opportunity assessment and Prototype development:

Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Assessing scope and potential scale for the opportunity. Understanding prototyping and Minimum Viable Product (MVP). Developing a prototype: Testing, and validation.

Core Teaching Tool: Venture Activity, No-code Innovation Tools, Class activity

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UNIT - IV: Business & Financial Models:

Introduction to Business Model and types, Lean Canvas Approach: 9-block lean canvas model, building lean canvas for your startup. Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using a financial template, understanding the basics of Unit economics, Economies of Scale and analyzing financial performance. Go-To-Market (GTM) approach – Selecting the Right Channel, creating digital presence, and building customer acquisition strategy. Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

UNIT - V: Startups and IPR:

Startup requirements, building founding team members and mentors, pitch preparation, start-up registration process, funding opportunities and schemes, institutional support to entrepreneurs, startup lifecycle, documentation, legal aspects in startup, venture pitching readiness, National Innovation Startup Policy (NISP) and its features. Patents, Designs, Patentability, Procedure for grants of patents. Indian Scenario of Patenting, International Scenario: International cooperation on Intellectual Property. Patent Rights: Scope of Patent Rights. Copyright, trademark, and GI. Licensing and transfer of technology.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities

Reference Books:

1. John R Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.
2. Ajay Batra, The Startup Launch Book- A Practical Guide for Launching Customer Centric Ventures, Wiley, 2020. (For Core Teaching Tool).
3. Entrepreneurship Development and Small Business Enterprises, Poornima M Charantimath, 3E, Pearson, 2018.
4. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
5. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
6. NISP -Brochure inside pages - startup_policy_2019.pdf

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OPERATING SYSTEMS LAB
(Common for CSE, IT, CSE(AI&ML), CSE(DS))

Course Objectives:

- To provide an understanding of the design aspects of operating system concepts through simulation.
- Introduce basic Unix commands, system call interface for process management, inter process communication and I/O in Unix.

Course Outcomes: The student will learn

- To provide an understanding of the design aspects of operating system concepts through simulation.
- Introduce basic Unix commands, system call interface for process management, inter process communication and I/O in Unix.

List of Experiments:

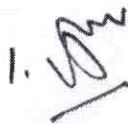
1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) Round Robin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, lseek, stat, fork, exit)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques a) Paging b) Segmentation
7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

Text Books:

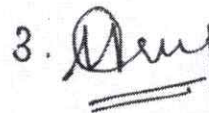
1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the Unix environment, W. R. Stevens, Pearson education.

Reference Books:

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI.
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI.
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education.
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education.

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COMPUTER NETWORKS LAB
(Common for CSE, CSE(AI&ML), CSE(DS))**Course Objectives:**

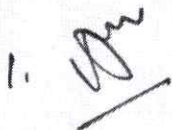
- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames

Course Outcomes: The student will learn

- Implement data link layer framing methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer
- To be able to work with different network tools

List of Experiments:

1. List of Experiments 1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijkstra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. Wireshark
 - i. Packet Capture Using Wire shark
 - ii. Starting Wire shark
 - iii. Viewing Captured Traffic
 - iv. Analysis and Statistics & Filters.
1. How to run Nmap scan
2. Operating System Detection using Nmap
3. Do the following using NS2 Simulator
 - I. NS2 Simulator-Introduction

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- II. Simulate to Find the Number of Packets Dropped
- III. Simulate to Find the Number of Packets Dropped by TCP/UDP
- IV. Simulate to Find the Number of Packets Dropped due to Congestion
- V. Simulate to Compare Data Rate & Throughput.
- VI. Simulate to Plot Congestion for Different Source/Destination
- VII. Simulate to Determine the Performance with respect to Transmission of Packets

Text Books:

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

Reference Books:

1. An Engineering Approach to Computer Networks, S.Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

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MACHINE LEARNING LAB

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

Course Objectives:

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes: The student will learn

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms
- Understand the machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

List of Experiments:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH.

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Tay

1. Machine Learning

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DATA VISUALIZATION - R PROGRAMMING/ POWER BI

(Common for CSE(DS), CSE, CSE(AI&ML))

Course Objectives:

- Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
- To discern patterns and relationships in the data.
- To build Dashboard applications.
- To communicate the results clearly and concisely.
- To be able to work with different formats of data sets.

Course Outcomes: At the end of the course a student should be able to

- Understand How to import data into Tableau.
- Understand Tableau concepts of Dimensions and Measures.
- Develop Programs and understand how to map Visual Layouts and Graphical Properties.
- Create a Dashboard that links multiple visualizations.
- Use graphical user interfaces to create Frames for providing solutions to real world problems.

Lab Problems:

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts(line, bar charts, Tree maps), Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.

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9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCES:

1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India.

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INDIAN KNOWLEDGE SYSTEM
(Common for CSE (AI&ML), CSE(DS) & IT)

Course Objectives:

- To provide a tribute of the rich culture and traditions of Indian knowledge system to students of various disciplines.
- To introduce historical account on the education and scientific literature available in ancient Indian traditions and its connections with ancient Indian Philosophy.
- To give insights about the applications of Bharatiya Jnana Parampara.
- To introduce Indian approach towards health and well-being.
- To elaborate vast contribution of ancient Indian researchers, engineers, scientists and architects to the modern world.

Course Outcomes: The student will learn

- Understand nature, scope and related fields of Indian knowledge system.
- Demonstrate the scientific literature available in ancient Indian traditions.
- Understanding the application of Bharatiya Jnana Parampara.
- Understand Indian approach towards Wellbeing.
- Appreciate vast contribution of ancient Indian researchers, engineers, scientists and architects to the modern world.

UNIT- I

Introduction to Indian Knowledge Systems

Meaning, Nature, Scope and Salient Aspects of Bharatiya Jnana Parampara - Introduction to Vedas, Upanishads, Vidya, Kala, Jnana, Shastra - Practices and Continuity of Tradition.

UNIT- II

Overview of History of Indian Education and Scientific Literature

Gurukul System - Role of Sanskrit in Natural Language Processing - Scientific Literature - Vedic Literature - Available Scientific Treatises - Inter linking's.

UNIT- III

Introduction to Scientific Theories from Pure Sciences from Ancient Indian Knowledge Systems:

Overview of theories from available ancient Indian Literature about Physics, Chemistry and Mathematics - Interlinking's and applications.

UNIT- IV

Introduction to Ancient Indian Wellness Systems

Concept of Wellness - Yoga System - Ayurveda System - Ancient Indian Aesthetics.

UNIT - V

Development of Engineering, Science, Technology & Fine Arts in India

Various Industries - Silk, Cotton and Ship Building - Evolution of Indian Fine Arts - Cave and Temple Architecture, Vastu - Vidya, Sculpture, Forts and Stepwells, Observatories and Paintings - Music and Naty akala - Cultural Traditions & Folk Arts.

Pedagogy for Teachers: Apart from Classroom Instruction, the following Methods are Suggested.

1. Project based activities and learning.
2. Presentation and case studies.
3. Film screening and book reviews.
4. Visit to historical places, archives Centre, research Centre or library nearby.

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Note: Activities mentioned above are only suggestive. Teacher-educators should encourage students to be innovative.

Suggested Readings:

1. B. Mahadevan, Bhat Vinayak and Nagendra Pavan R.N., (2022) 'Introduction to Indian Knowledge Systems: Concepts and Applications' PHI learning PVT, New Delhi ISBN [9789391818203]
2. Dharmapal (1971) 'Indian Science and Technology in the Eighteenth Century'. Other India Press, Goa.
3. Kapil Kapoor, Singh Avdhesh Kumar, (2005) 'Indian Knowledge Systems' D.K. Print world (P) Ltd. ISBN 10: 8124603367 / ISBN 13: 9788124603369
4. Chakradeo, Ujwala, Temples of Bharat, Aayu Publications, New Delhi, 2024.
5. D.N. Bose, S.N. Sen and B. V. Subbarayappa, A Concise History of Science in India, Indian National Science Academy, New Delhi, 2009.
6. Datta B. and A. N. Singh, History of Hindu Mathematics: Parts I and II, Asia Publishing House, Bombay, 1962.
7. Kapoor, K. (2021), Indian Knowledge System: Nature, Philosophy, Character in Indian Knowledge System, vol. 1, Pub. Indian Institute of Advanced Studies, Shimla
8. Mahadevan, B., Bhat, V.R., Pavana, N. (2022), Philosophical Systems, in Introduction to Indian Knowledge System, Pub. PHI Learning, New Delhi.
9. Mahadevan, B., Bhat, V.R., Pavana, N. (2022), Knowledge: Framework and Classification, in Introduction to Indian Knowledge System, Pub. PHI Learning, New Delhi.

Video Resources:

1. Introductory lectures by Prof. Gauri Mahulikar
2. Introductory lectures by Prof. Kapil Kapoor

Websites:

- <https://iksin dia.org/index.php>
- Official Website of IKS- Indian Knowledge System
- <https://www.youtube.com/watch?v=uKcf-hSleUE>
- Address by Prof Kapil Kapoor | Indian Institute of Advanced Study (FDP 2021)
- https://www.youtube.com/watch?v=MDJTXNiH2_A
- Mukul Kaniitkar on Bharatiya Knowledge System
- <https://www.youtube.com/watch?v=uARMhv97pjk>
- <https://www.youtube.com/watch?v=oTwgf56GbsA>
- Scientific History of India | Mukul Kaniitkar Lecture in DTU
- <https://youtu.be/gNjNmPJqXJc?si=WFBbuUT65mLZzpOW>
- Ancient India's Scientific Achievements & Contribution in Mathematics, Astronomy, Science & Medicine

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Annexure-IV

Approval of Syllabus of CSE(AI&ML) department for VR25-II B. Tech II Semester.

S.No.	Regulation	Year & Sem	Subject Name	Department
1	VR25	II-II	Machine Learning	CSE, CSE(AI&ML), CSE(DS)
2	VR25	II-II	Machine Learning Lab	CSE, CSE(AI&ML), CSE(DS)

B.Tech

II Year - II Semester

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3	0	0	3

MACHINE LEARNING

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

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To have a thorough understanding of the Supervised and Unsupervised learning techniques
3. To study the various probability-based learning techniques

Course Outcomes: The student will learn

1. Distinguish between, supervised, unsupervised and semi-supervised learning.
2. Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
3. Design an ensemble model to increase the classification accuracy
4. Understand the principles of RL evolutionary computing algorithms
5. Demonstrate teamwork, documentation, and communication in ML-based projects

UNIT - I:

Introduction to Machine Learning: Types of Human learning, machine learning process, Well-posed learning problem, Types of machine learning and comparison, applications of machine learning. Model Preparation, Evaluation and feature engineering: Machine learning activities, Types of data in machine learning, dataset understanding, plotting and exploration, checking data quality, remediation, data pre-processing, selecting a model, predictive and descriptive models, supervised learning model training, cross-validation and boot strapping, lazy vs eager learner, interpreting the model- underfitting, overfitting, bias-variance trade-off. Parameter for evaluating performance of classification, regression, and clustering model. Improving performance of a model.

UNIT - II:

Feature Engineering: Feature transformation - feature construction, feature extraction by PCA, SVD, LDA. Feature subset selection - feature relevancy and redundancy measures. Feature selection process and approaches.

Review of Probability concepts: joint probability, conditional probability, bayes rule, Common discrete and continuous distributions, dealing with multiple random variables, central limit theorem. Bayes classifier, Multi-class Classification, Naïve Bayes classifier, Bayesian belief network.

UNIT - III:

Supervised Learning - Introduction to supervised learning,

Regression: Introduction of regression, Regression algorithms: Simple linear regression, Multiple linear regression, Polynomial regression model, Logistic regression, Maximum

1. Murugesu

2. Vitha

3. Vitha

likelihood estimation. Classification: Classification model and learning steps, Classification algorithms: Naïve Bayes classifier, Distance measures, k-Nearest Neighbor (kNN), Decision tree, Support vector machines, Kernel trick, Random Forest.

UNIT - IV:

Unsupervised Learning: Introduction to unsupervised learning, Unsupervised vs supervised learning, Application of unsupervised learning, Clustering and its types, Partitioning method: k-Means and KMedoids, Hierarchical clustering, Density-based methods – DBSCAN.

UNIT - V:

Artificial Neural Network: Biological neuron, Artificial neuron, Activation functions, neural network architecture, perceptron, learning process in ANN, Back propagation.

Introduction to deep learning, overview of reinforcement learning, Representation learning, Evolutionary learning. Case-study of ML applications: Image recognition, Email spam filtering, Online fraud detection.

Text Books:

1. Saikat Dutt, S. Chjandramouli, Das – Machine Learning, Frist Edition, Pearson
2. M N Murty, Anathanarayana V S – Machine Learning, First Edition, University Press
3. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.

Reference Books:

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition,
2. Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

- | | | |
|-------------------|--------------------------|---------------------|
| 1. <u>Murthy</u> | 2. <u>Bha</u> | 3. <u>Blue</u> |
| 4. <u>Vasari</u> | 5. <u>K. Backen</u> | 6. <u>R. Sindhu</u> |
| 7. <u>Thay</u> | 8. <u>B. Balakrishna</u> | 9. <u>JB</u> |
| 10. <u>Janya</u> | 11. <u>Rupa</u> | 12. <u>Cony</u> |
| 13. <u>Swarna</u> | 14. <u>N. Jey</u> | |

B.Tech

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II Year - II Semester

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MACHINE LEARNING LAB
(Common to CSE, CSE(AI&ML),CSE(DS))

Course Objectives:

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes: The student will learn

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms
- Understand the machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

List of Experiments:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH.

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Tay

1. Mitchell

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4. Vasari

5 K. Bakken

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Annexure-V

Annexure-V

Approval of B. Tech Syllabi of other departments for VR25 II B. Tech I & II Semester

S.No.	Regulation	Year & Sem	Subject Name	Department
1	VR25	II-I	Node JS/React JS/Django	CSE, CSE(DS)
2	VR25	II-II	Machine Learning	CSE, CSE(DS)
3	VR25	II-II	Machine Learning Lab	CSE, CSE(DS)
4	VR25	II-II	Node JS/React JS/Django, UI Design – Flutter	IT

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B.Tech

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II Year - I Semester

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NODE JS/ REACT JS/DJANGO
(Common to CSE, CSE(AI&ML), CSE (DS))

Course Objectives:

1. To implement the static web pages using HTML and do client-side validation using JavaScript.
2. To design and work with databases using Java
3. To develop an end to end application using java full stack.
4. To introduce Node JS implementation for server-side programming.
5. To experiment with single page application development using React.

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

1. Build a custom website with HTML, CSS, Bootstrap and little JavaScript.
2. Demonstrate Advanced features of JavaScript and learn about JDBC 3.
Develop Server – side implementation using Java technologies like
4. Develop the server – side implementation using Node JS.
5. Design a Single Page Application using React.

Exercises:

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)

1. M. R. Rao

2. V. R. Rao

3. V. R. Rao

11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into GitHub.

Reference Books:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010.
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node ,2nd Edition, APress.

1. Murugan

2. Vinay

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4. Vasavi

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6. R. Sindhu

7. Shrey

8. B. Bakem

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12. Suraj

13. Swarna

14. M. Suraj

B.Tech

II Year - II Semester

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MACHINE LEARNING
(Common to CSE, CSE(AI&ML),CSE(DS))

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
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UNIT - III:

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Regression: Introduction of regression, Regression algorithms: Simple linear regression, Multiple linear regression, Polynomial regression model, Logistic regression, Maximum

1. Model

2. Data

3. Learn

likelihood estimation. Classification: Classification model and learning steps, Classification algorithms: Naïve Bayes classifier, Distance measures, k-Nearest Neighbor (kNN), Decision tree, Support vector machines, Kernel trick, Random Forest.

UNIT - IV:

Unsupervised Learning: Introduction to unsupervised learning, Unsupervised vs supervised learning, Application of unsupervised learning, Clustering and its types, Partitioning method: k-Means and KMedoids, Hierarchical clustering, Density-based methods – DBSCAN.

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Reference Books:

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2. Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

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B.Tech

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II Year - II Semester

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MACHINE LEARNING LAB
(Common to CSE, CSE(AI&ML), CSE(DS))

Course Objectives:

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3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

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REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Tay

1. Machine Learning

2. Python

3. Idm

4. Vasari

5 K. Bakken

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8 B. Bakken

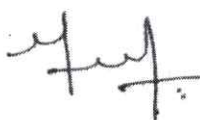
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B.Tech	L	T	P	C
II Year - II Semester	0	0	2	1

NODE JS/ REACT JS/ DJANGO, UI DESIGN - FLUTTER
(IT)

Prerequisites: Object Oriented Programming through Java, HTML Basics.

Course Objectives:

1. To implement responsive web pages using HTML, CSS3, Bootstrap, and JavaScript validation.
2. To develop full-stack applications with Node.js, Express, React.js, and secure them using JWT.
3. To build and integrate RESTful APIs using Node.js and Django with frontend CRUD operations.
4. To create Flutter apps with responsive layouts, state management, and custom widgets.
5. To enhance Flutter apps by integrating REST APIs and adding animations for better user experience.

Course Outcomes:

1. Design responsive web pages using HTML, CSS, Bootstrap, and JavaScript.
2. Develop backend applications using Java and Node.js.
3. Build single-page applications with React.js.
4. Create Flutter apps with custom widgets, layouts, and forms.
5. Integrate APIs, add animations, and perform UI testing in Flutter apps.

Exercises:

1. Build a responsive website with registration, login, catalog, and cart pages using HTML, CSS3, Bootstrap, and JavaScript validation.
2. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages
3. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
4. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
5. Implement JWT authentication in Node.js to create secure endpoints.
6. Create a TODO application in react with necessary components and deploy it into github.
7. Integrate a React frontend with Node.js backend to perform CRUD operations on a shared dataset (e.g., MongoDB, MySQL.)
8. Build a Django REST API for managing student data, tested using Postman.
9. Install Flutter and Dart SDK; Write Dart programs on data types, control flow, Functions, Class & Objects and collections to understand syntax and features.

1. MueRenu

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10. Create a Flutter app showcasing common widgets (Text, Image, Container, Card, ListView).
11. Design a responsive UI using Row, Column, Stack, media queries, and breakpoints.
12. Implement screen navigation using Navigator and named routes.
13. Use stateful & stateless widgets; manage state using Provider or setState.
14. Design a form in Flutter with input fields, validation, and error handling (e.g., student registration form).
15. Fetch and display data from a REST API (e.g., weather or student info) in Flutter.
16. Add basic animations (fade or slide) to a Flutter app for enhancing UI interactions

TEXT BOOK:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

Reference Books:

2. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
3. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
4. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, A Press.

1. Meehan

2. Baba

3. Wini

4. Vasanti

5. K. Bakker

6. R. Sindhu

7. Shrey

8. B. Bakker

9. JD

10. Laya

11. Rupa

12. Shrey

13. Swapna

14. N. Shrey

Annexure-VI



VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



COMPUTER SCIENCE & ENGINEERING (AI & ML)

COURSE STRUCTURE-VR24

III B.Tech.-I Semester

S.No.	Course Code	Course	L	T	P	Credits
1	CS501PC	Design and Analysis of Algorithms	3	1	0	4
2	CS502PC	Computer Networks	3	0	0	3
3	ML503PC	Machine Learning	3	0	0	3
4	MS504BS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective-I	3	0	0	3
6	CS505PC	Computer Networks Lab	0	0	2	1
7	ML506PC	Machine Learning Lab	0	0	2	1
8	EN506BS	Advanced English Communication Skills lab	0	0	2	1
9	ML507PC	Skill Development Course (UI design- Flutter)	0	0	2	1
10	MC508BS	Intellectual Property Rights	3	0	0	0
Total			18	1	8	20

III B.Tech.-II Semester

S.No.	Course Code	Course	L	T	P	Credits
1	ML601PC	Knowledge Representation and Reasoning	3	0	0	3
2	DS602PC	Data Analytics	3	0	0	3
3	CS603PC	Natural Language Processing	3	0	0	3
4		Professional Elective -II	3	0	0	3
5		Open Elective-I	3	0	0	3
6	CS604PC	Natural Language Processing Lab	0	0	3	1.5
7	DS605PC	Data Analytics Lab	0	0	3	1.5
8	ML606PC	Industrial Oriented Mini Project/ Internship/Skill Development Course (DevOps)	0	0	4	2
9	MC607BS	Environmental Science	3	0	0	0
Total			18	0	10	20

Note: L-Theory

T-Tutorial

P-Practical

C-Credits

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2. Bala

3. Viji

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COMPUTER SCIENCE & ENGINEERING (AI & ML)

Professional Elective-I

S.No.	Course Code	Course	L	T	P	Credits
1	ML511PE	Graph Theory	3	0	0	3
2	ML512PE	Introduction to Data Science	3	0	0	3
3	ML513PE	Web Programming	3	0	0	3
4	EC514PE	Image Processing	3	0	0	3
5	ML515PE	Computer Graphics	3	0	0	3

Professional Elective-II

S.No.	Course Code	Course	L	T	P	Credits
1	ML521PE	Software Testing Methodologies	3	0	0	3
2	ML522PE	Information Retrieval Systems	3	0	0	3
3	ML523PE	Pattern Recognition	3	0	0	3
4	ML524PE	Computer Vision and Robotics	3	0	0	3
5	ML525PE	Data Warehousing and Business Intelligence	3	0	0	3

Open Elective-I

S.No.	Course Code	Course	L	T	P	Credits
1	ML611OE	Fundamentals of AI	3	0	0	3
2	ML612OE	Machine Learning Basics	3	0	0	3

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13. Swapna

14. N. Jay

Annexure-VII



VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

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Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



COMPUTER SCIENCE & ENGINEERING (AI & ML)

COURSE STRUCTURE-VR24

IV B.Tech.-I Semester

S.No.	Course Code	Course	L	T	P	Credits
1	ML701PC	Deep Learning	3	0	0	3
2	ML702PC	Nature Inspired Computing	2	0	0	2
3		Professional Elective -III	3	0	0	3
4		Professional Elective -IV	3	0	0	3
5		Open Elective - II	3	0	0	3
6	MS703BS	Professional Practice, Law & Ethics	2	0	0	2
7		Professional Elective - III Lab	0	0	2	1
8	ML704PC	Project Stage - I	0	0	6	3
Total			16	0	8	20

IV B.Tech.-II Semester

S.No.	Course Code	Course	L	T	P	Credits
1		Professional Elective - V	3	0	0	3
2		Professional Elective - VI	3	0	0	3
3		Open Elective - III	3	0	0	3
4	ML801PC	Project Stage - II including Seminar	0	0	22	11
5		Total	9	0	22	20

Note: L-Theory

T-Tutorial

P-Practical

C-Credits

1. Murali Rao

2. Vishu

3. Vidhi

4. Vasari

5. K. Bakshi

6. R. Sindhu

7. Deep

8. B. Bala

9. JD

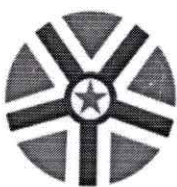
10. Jay

11. Rupa

12. Chitra

13. Swarna

14. N. Jyoti



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Professional Elective -III

S.No.	Course Code	Course	L	T	P	Credits
1	EC731PE	Internet of Things	3	0	0	3
2	ML732PE	Data Mining	3	0	0	3
3	ML733PE	Scripting Languages	3	0	0	3
4	ML734PE	Mobile Application Development	3	0	0	3
5	ML735PE	Cloud Computing	3	0	0	3

Professional Elective -III Lab

S.No.	Course Code	Course	L	T	P	Credits
1	EC711PE	Internet of Things Lab	0	0	2	1
2	ML712PE	Data Mining Lab	0	0	2	1
3	ML713PE	Scripting Languages Lab	0	0	2	1
4	ML714PE	Mobile Application Development Lab	0	0	2	1
5	ML715PE	Cloud Computing Lab	0	0	2	1

#Courses in PE - III and PE - III Lab must be in 1-1 correspondence.

Professional Elective -IV

S.No.	Course Code	Course	L	T	P	Credits
1	ML741PE	Quantum Computing	3	0	0	3
2	ML742PE	Expert Systems	3	0	0	3
3	ML743PE	Semantic Web	3	0	0	3
4	ML744PE	Game Theory	3	0	0	3
5	ML745PE	Mobile Computing	3	0	0	3

Professional Elective -V

S.No.	Course Code	Course	L	T	P	Credits
1	ML851PE	Social Network Analysis	3	0	0	3
2	ML852PE	Federated Machine Learning	3	0	0	3
3	ML853PE	Augmented Reality & Virtual Reality	3	0	0	3
4	ML854PE	Web Security	3	0	0	3
5	ML855PE	Ad-hoc & Sensor Networks	3	0	0	3

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3. Vaha

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Professional Elective -VI

S.No.	Course Code	Course	L	T	P	Credits
1	EC861PE	Speech and Video Processing	3	0	0	3
2	ML862PE	Robotic Process Automation	3	0	0	3
3	ML863PE	Randomized Algorithms	3	0	0	3
4	ML864PE	Cognitive Computing	3	0	0	3
5	ML865PE	Conversational AI	3	0	0	3

Open Elective-II

S.No.	Course Code	Course	L	T	P	Credits
1	ML721OE	Introduction to Natural Language Processing	3	0	0	3
2	ML722OE	AI applications	3	0	0	3

Open Elective-III

S.No.	Course Code	Course	L	T	P	Credits
1	ML831OE	Chatbots	3	0	0	3
2	ML832OE	Evolutionary Computing	3	0	0	3

1. Murugan

2. Bhava

3. Vidhi

4. Vasavi

5. K. Bakari

6. R. Sindhu

7. Deep

8. B. Balaji

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Annexure-VIII

B.Tech

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III Year - I Semester

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DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE, AIML)

Course Objectives:

- Introduces the notations for analysis of the performance of algorithms and the data structure of disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate
- Describes how to evaluate and compare different algorithms using worst-, average-, and best case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes: The student will learn

- Analyze algorithms, improve the efficiency of algorithms and ability to understand and estimate the performance of algorithm.
- Understand the general method of backtracking for solving combinatorial problems.
- Apply dynamic programming paradigm to solve the problems.
- Understand the concept and working principle of the greedy method for solving optimization problems.
- Interpret NP-hard and NP-complete problems.

UNIT - I Introduction:

Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation. Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue-Heaps, Heapsort.

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, hamiltonian cycles.

UNIT - III

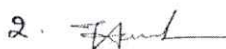
Dynamic Programming: General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT - IV:

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

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UNIT - V:

Branch and Bound: General method, applications - Traveling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution. **NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes, Cook's theorem.

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University press, 1998.

Reference Books:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

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III Year - I Semester

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COMPUTER NETWORKS

(Common for CSE, CSE(AI&ML), CSE(DS))

Course Objectives:

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks. □
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes: The student will learn

- Outline the basics of computer networks and various layers.
- Demonstrate multiple access protocols.
- Interpret network layer and routing algorithms.
- Illustrate internetworking and various transport protocols.
- Make use of various protocols of application layer.

UNIT - I Introduction:

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless Transmission.

Data link layer: Design issues, framing, Error detection and correction.

UNIT - II

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.

Medium Access sublayer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III

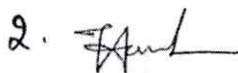
Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV:

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V:

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

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Text Books:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

Reference Books:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. 2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

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III Year - I Semester

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MACHINE LEARNING
(Common to IT, CSE(AI&ML))**Course Objectives:**

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

Course Outcomes:

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensemble to increase the classification accuracy
- Demonstrate teamwork, documentation, and communication in ML-based projects

UNIT - I:

Learning–Types of Machine Learning – Supervised Learning – The Brain and the Neuron– Design a Learning System–Perspectives and Issues in Machine Learning–Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm–Linear Discriminants:–Perceptron–Linear Separability – Linear Regression.

UNIT - II:

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

UNIT - III:

Learning with Trees–Decision Trees–Constructing Decision Trees–Classification and Regression Trees–Ensemble Learning–Boosting–Bagging–Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

UNIT - IV:

Dimensionality Reduction – Linear Discriminant Analysis–Principal Component Analysis – Factor Analysis–Independent Component Analysis–Locally Linear Embedding – Isomap – Least Squares Optimization

Evolutionary Learning–Genetic algorithms–Genetic Offspring:–Genetic Operators–Using

1. *Meera*2. *Vishu*3. *Vidya*

Genetic Algorithms

UNIT - V:

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

Text Books:

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

Reference Books:

1. Tom M Mitchell, -Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, -Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, -Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
4. Ethem Alpaydin, -Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

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III Year - I Semester

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BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

(Common for CSE(AI&ML) & ECE)

Course Objectives:

- To understand the fundamentals of business and economics.
- To analyze demand and supply concepts.
- To explain production and cost theories.
- To develop foundational knowledge of financial accounting.
- To interpret and analyze financial statements using ratio analysis, fund flow, and cash flow analysis for assessing the financial performance and position of a business.

Course Outcomes: The student will learn

- The students will understand the various Forms of Business and the impact of economic variables on the Business.
- Understand the elasticity of the demand of the product, different types, and measurement of elasticity of demand and factors influencing on elasticity of demand and supply.
- Recognize the Production function, features of Iso-Quants and Iso-Costs, Market Structure, Pricing aspects are learnt.
- The students can study the firm's financial position by analyzing the Financial Statements of a Company.
- Evaluate different types of financial ratios knowing liquidity, solvency and profitability position of business.

UNIT - I: Introduction to Business and Economics

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics

UNIT - II: Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making.

Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting. Supply Analysis: Determinants of Supply, Supply Function & Law of Supply

UNIT - III: Production, Cost, Market Structures & Pricing

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV: Financial Accounting:

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

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Unit V: Financial Analysis through Ratios

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXTBOOKS:

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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III Year - I Semester

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GRAPH THEORY (Professional Elective – I)
(CSE(AI & ML))**Course Objectives:**

- Understanding graphs, trees, connected paths, applications of trees and graphs.

Course Outcomes:

- Know some important classes of graph theoretic problems
- Prove central theorems about trees, matching, connectivity, coloring and planar graphs
- Describe and apply some basic algorithms for graphs
- Use graph theory as a modeling tool
- Demonstrate mathematical reasoning and teamwork in graph-based problem solving

UNIT - I:

Introduction-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

UNIT - II:

Connected graphs and shortest paths - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT - III:

Trees- Definitions and characterizations, Number of trees, Cayley's formula, Kirchoff's matrix-tree theorem, Minimum spanning trees, Kruskal's algorithm, Prim's algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury's algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

UNIT - IV:

Independent sets coverings and matchings– Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall's Theorem, Konig's Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

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3. Vile

4. Vasa

UNIT - V:

Vertex Colorings- Basic definitions, Cliques and chromatic number, Mycielski's theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

Text Books:

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

Reference Books:

1. Lecture Videos: <http://nptel.ac.in/courses/111106050/13>
2. Introduction to Graph Theory, Douglas B. West, Pearson.

1. Mithun

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4. Vasavi

5. K. Praveen

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III Year - I Semester

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INTRODUCTION TO DATA SCIENCE (Professional Elective – I)
(CSE (AI & ML))**Course Objectives:**

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

Course Outcomes:

- Understand basic terms of statistical modeling and data science
- Implementation of R programming concepts
- Utilize R elements for data visualization and prediction
- Utilize R elements for data handling
- Perform data reduction and apply visualization techniques

UNIT - I:**Introduction**

Definition of Data Science- Big Data and Data Science hype – and getting past the hype – Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II: Data Types & Statistical Description

Types of Data: Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III:

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,

Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

1. Mike Rosh

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UNIT - IV:

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT - V:

Charts and Graphs: Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

Regression: Linear Regression Analysis, Multiple Linear regression

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

Reference Books:

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Education.
3. Brian S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

1. Muesha

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3. Dhruv

4. Vasavi

5. K. Bakken

6. R. Sindhu

7. Deep

8. B. Balakrishna

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III Year - I Semester

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WEB PROGRAMMING (Professional Elective – I)
(CSE (AI & ML))**Course Objectives:**

- Understand the technologies used in Web Programming.
- Know the importance of object-oriented aspects of Scripting.
- Understand creating database connectivity using JDBC.
- Learn the concepts of web-based application using sockets.

Course Outcomes:

- Design web pages.
- Use technologies of Web Programming.
- Apply object-oriented aspects to Scripting.
- Create databases with connectivity using JDBC.
- Build web-based application using sockets.

UNIT - I: Client side Programming**HTML-** Basic Tags- List, Tables, Images, Forms, Frames, CSS**JAVA Script** -Web page Designing using HTML, Scripting basics- Client side and server side scripting. Java ScriptObject, names, literals, operators and expressions- statements and features- events - windows - documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML5-CSS3- HTML 5 canvas - Web site creation using tools.**UNIT - II: JAVA**

Introduction to object-oriented programming-Features of Java – Data types, variables and arrays – Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces – Exception Handling – Multithreaded Programming – Input/Output – Files – Utility Classes – String Handling.

UNIT - III: JDBC

JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets – UDP sockets, Java Beans –RMI.

UNIT - IV: APPLET

Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling. Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus. Servlet – life cycle of a servlet. The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction to JSP.

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UNIT - V: XML AND WEB SERVICES

Xml – Introduction-Form Navigation-XML Documents- XSL – XSLT- Web services- UDDI-WSDL-Java web services – Web resources.

TEXT BOOKS:

1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5th Edition.
2. Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw- Hill Edition.
3. Michael Morrison XML Unleashed Tech media SAMS.

Reference Books:

1. John Pollock, Javascript - A Beginners Guide, 3rd Edition — Tata McGraw-Hill Edition.
2. Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill, 2002.

1. Meelhu

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III Year-I Semester

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IMAGE PROCESSING (Professional Elective – I)
(COMMON TO CSE& CSE(AI&ML), CSE(DS) & IT)

Prerequisites:

1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of digital signal processing is desirable.
2. A course on "Computational Mathematics"
3. A course on "Computer Oriented Statistical Methods"

Course Objectives:

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
- The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

Course Outcomes:

- Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
- Demonstrate the knowledge of filtering techniques
- Demonstrate the knowledge of 2D transformation techniques.
- Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques.

UNIT-I: Digital Image Fundamentals

Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT-II:

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening..

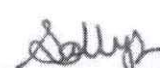
UNIT-III:

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-IV:

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

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UNIT - V:

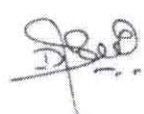
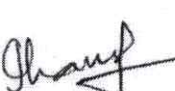
Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

Text Book:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2 nd Ed, 2004.

Reference Books:

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MATLAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wiley, 3rd Edition, 2004.

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III Year - I Semester

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COMPUTER GRAPHICS (Professional Elective – I)
(CSE(AI&ML))**Prerequisites**

- Programming for problem solving and Data Structures

Course Objectives:

- Provide the basics of graphics systems including Points and lines, line drawing algorithms, 2D, 3D objective transformations

Course Outcomes:

- Explore applications of computer graphics
- Understand 2D, 3D geometric transformations and clipping algorithms
- Understand 3D object representations, curves, surfaces, polygon rendering methods, color models
- Analyze animation sequence and visible surface detection methods
- Design and evaluate real-world image processing applications in domains such as medical imaging, computer vision, remote sensing, and multimedia systems while

UNIT - I

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random-scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms (DDA and Bresenham's Algorithm) circle-generating algorithms and ellipse - generating algorithms

Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

UNIT - II

2-D geometric transformations: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, clipping operations, point clipping, Line clipping-Cohen Sutherland algorithms, Polygon clipping-Sutherland Hodgeman polygon clipping algorithm.

UNIT - III

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces, Polygon rendering methods, color models and color applications.

UNIT - IV

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear

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transformations, composite transformations.

viewing: Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms and clipping.

UNIT - V

Computer animation: Design of animation sequence, general computer animation functions, raster animations, computer animation languages, key frame systems, motion specifications.

Visible surface detection methods: Classification, back-face detection, depth-buffer method, BSP-tree method, area sub-division method and octree method.

TEXT BOOKS:

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education

Reference Books:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
4. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
5. Computer Graphics, Steven Harrington, TMH.

1. Murthy

2. Khan

3. White

4. Varai

5. H. Baker

6. R. Sindhu

7. Shree

8. B. Bala

9. DB

10. Jay

11. Piya

12. Qus

13. Swarna

14. M. Jaf

B. Tech CSE

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III Year - I Semester

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COMPUTER NETWORKS LAB
(Common for CSE,CSE(AIML),CSE(DS))

Course Objectives:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames

Course Outcomes: The student will learn

- Implement data link layer framing methods .
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer.
- To be able to work with different network tools.

List of Experiments:

1. Implement data link layer framing methods such as character, character-stuffing and bit stuffing.
 2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
 3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
 4. Implement Dijkstra's algorithm to compute the shortest path through a network
 5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
 6. Implement distance vector routing algorithm for obtaining routing tables at each node.
 7. Implement data encryption and data decryption
 8. Write a program for congestion control using Leaky bucket algorithm.
 9. Write a program for frame sorting techniques used in buffers.
 10. Wireshark
 - i. Packet Capture Using Wire shark
 - ii. Starting Wire shark
 - iii. Viewing Captured Traffic
 - iv. Analysis and Statistics & Filters.How to run Nmap scan
Operating System Detection using Nmap
- Do the following using NS2 Simulator
- i. NS2 Simulator-Introduction
 - ii. Simulate to Find the Number of Packets Dropped
 - iii. Simulate to Find the Number of Packets Dropped by TCP/UDP

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Text Books:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

Reference Books:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. 2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

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4. Devi

11. Pat

5. Ramesh

12. S

6. Lasya

13. A

7. Am

14. B. Geetha

8. Parimal

15. Barun

9. B. K.

16. Anita

10. Arjun

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III Year - I Semester 0 0 2 1

Machine Learning Lab
(Common to IT, CSE(AI&ML))

Course Objectives:

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes:

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance
- Demonstrate teamwork, documentation, and communication in ML projects

List of Experiments

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

Text Books:

1. Machine Learning – Tom M. Mitchell, - MGH.

Reference Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

1. Murkesw

2. Barha

3. Varu

4. Vasari

5. K. Sathya

6. R. Sindhu

7. Deep

8. B. Balakrishna

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III Year – I Semester

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ADVANCED ENGLISH COMMUNICATION SKILLS LAB

(Common for ECE, CSE, IT, CSE(DS), CSE(AI&ML))

1. Introduction

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organize ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. Activities on Listening and Reading Comprehension:

Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Subskills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice

2. Activities on Writing Skills:

Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing – Writing a Letter of Application – Resume vs. Curriculum Vitae – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.

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3. Activities on Presentation Skills

Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Gloss phobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation

4. Activities on Group Discussion (GD):

Functions: Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies – Exercises for Practice.

5. Interview Skills:

Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

4. Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T.V, a digital stereo & Camcorder
- Headphones of High quality

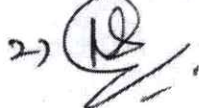
5. Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- Oxford Advanced Learner's Dictionary, 10th Edition
- Cambridge Advanced Learner's Dictionary
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech

6. Books Recommended:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English*. Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). *Academic Writing: A Handbook for International Students*. (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). *Technical Communication, Principles and Practice*. (4th Edition) Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication*. Cengage Learning Pvt. Ltd. New

1) 

2) 

3) 

Delhi.

7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use Series*. Cambridge University Press
8. Sen, Leela. (2009). *Communication Skills*. PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). *Writing with Power*. Oxford University Press.
10. Goleman, Daniel. (2013). *Emotional Intelligence: Why it can matter more than IQ*. Bloomsbury Publishing.

1) *Delhi*

2) *(18)*

3) *18*

4) *AB SBT*

5) *Cirane*

6) *3*

7) *82*

8) *Hand*

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III Year - I Semester

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Skill Development Course (UI design- Flutter)

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

Course Objectives:

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widgets and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

Course Outcomes:

- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

List of Experiments: Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.
b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
b) Implement navigation with named routes.
5. a) Learn about stateful and stateless widgets.
b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.
b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.
b) Implement form validation and error handling.
8. a) Add animations to UI elements using Flutter's animation framework.
b) Experiment with different types of animations (fade, slide, etc.).
9. a) Fetch data from a REST API.
b) Display the fetched data in a meaningful way in the UI.
10. a) Write unit tests for UI components.
b) Use Flutter's debugging tools to identify and fix issues.

Text Books:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

1. Muneer

2. Baha

3. Vahid

4 Vasait

5 K. Baken

6 R. Sindhu

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III Year - I Semester

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INTELLECTUAL PROPERTY RIGHTS
(Common for ECE, CSE, CSE(DS), CSE(AI&ML), IT)**Course Objectives:**

- To introduce the fundamentals of Intellectual Property Rights (IPRs).
- To provide comprehensive knowledge of trademark law.
- To explain the principles of copyright and patent laws.
- To familiarize students with trade secrets and unfair competition laws.
- To expose students to recent developments and international perspectives in IPR.

Course Outcomes: The student will learn

- Understand and explain the concept, importance, and types of Intellectual Property Rights along with international IPR organizations, treaties, and agencies.
- Analyze and apply trademark laws to identify protectable trademarks, evaluate trademark selection, and understand the trademark registration process.
- Explain and differentiate copyright and patent laws, including originality, ownership, rights, registration, patent searching, and transfer of rights.
- Interpret trade secret and unfair competition laws, and assess legal issues related to misappropriation, false advertising, and rights of publicity.
- Evaluate recent and international developments in IPR and perform basic intellectual property audits in global business and innovation contexts.

UNIT - I: Introduction to Intellectual property

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT - II: Trademarks:

Purpose and function of trademarks, acquisition of trademark rights, protectable matter, selecting, and evaluating trademarks, trademark registration processes.

UNIT - III:**Law of copyrights:**

Fundamental copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, international copyright law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT - IV: Trade Secrets:

Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition: Misappropriation of the right of publicity, false advertising.

UNIT-V: New development of intellectual property:

New developments in trademark law; copyright law, patent law, intellectual property audits. International overview on intellectual property, international – trademark law, copyright law, international patent law, and international development in trade secrets law.

TEXTBOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

1. *U*
2. *Copyright*
3. *SP*
4. *S. Subramaniam Sullana*
5. *Erishen*
6. *Seiji*
7. *M. M. M. M.*
8. *M. M. M.*
9. *K. J. J.*
10. *R. R.*

B.Tech.

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III Year - II Semester

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KNOWLEDGE REPRESENTATION AND REASONING

(CSE(AI & ML))

Course Objectives:

- To investigate the key concepts of Knowledge Representation (KR) techniques and different notations.
- To integrate the KR view as knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques and process, knowledge acquisition and sharing of ontology.

Course Outcomes:

- Analyze and design knowledge-based systems intended for computer implementation.
- Acquire theoretical knowledge about principles for logic-based representation and reasoning.
- Ability to understand knowledge-engineering process
- Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge.
- Design hybrid systems that merge multiple AI paradigms, overcoming knowledge acquisition challenges to create robust, interpretable, and adaptable knowledge bases.

UNIT - I

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic

Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT - II

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

UNIT - III

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.

UNIT - IV

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change

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Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT - V

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics
Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition

TEXT BOOKS:

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.

1. Murthy

2. Bhatta

3. White

4. Vasani

5. H. Baker

6. R. Sindhu

7. Deep

8. B. Bala

9. JD

10. Jaya

11. Rupa

12. Gang

13. Swarna

14. N. Jyoti

B.Tech. CSE(AI&ML)

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III Year - II Semester

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DATA ANALYTICS

Course Objectives:

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and **estimate the accuracy of the algorithms.**
- To understand the various search methods and visualization techniques.
- Introduce visual perception and core skills for visual analysis

Course Outcomes: The student will learn

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and Variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT - III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

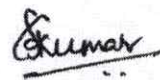
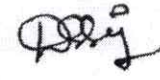
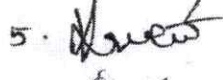
UNIT - IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.

Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT - V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

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Text Books:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

Reference Books:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman
Milliway Labs Jeffrey D Ullman Stanford Univ.

1. Kumar

2. Book

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4. Big

5. Howe

6. Book

7. Deep

8. AI

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B.Tech. -AIML L T P C
III Year - II Semester 3 0 0 3

NATURAL LANGUAGE PROCESSING

Course Objectives:

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes: The student will learn

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammar.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Design, implement, and analyze NLP algorithms; and design different language modeling Techniques.

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

UNIT - II

Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

UNIT - III

Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues

Semantic Parsing I: Introduction, Semantic Interpretation, System Paradigms, Word Sense

UNIT - IV:

Semantic Parsing II: Predicate-Argument Structure, Meaning Representation Systems

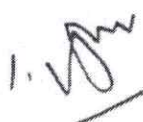
UNIT - V:

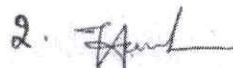
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling

Text Books:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.

Reference Books:

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1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

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2. Frank

3. Ang

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5. Ramesh

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B.Tech. L T P C
III Year - II Semester 3 0 0 3

SOFTWARE TESTING METHODOLOGIES (Professional Elective – II)
(CSE(AI&ML))

Prerequisites:

1. Software Engineering

Course Objectives:

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using the latest tools.

Course Outcomes:

- Understand purpose of testing and path testing
- Understand strategies in data flow testing and domain testing
- Develop logic-based test strategies
- Understand graph matrices and its applications
- Implement test cases using any testing automation tool

UNIT - I:

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT - II:

Transaction Flow Testing: transaction flows, transaction flow testing techniques.

Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.

Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT - III:

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT - IV:

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

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UNIT - V:

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter/selenium/soapUI/Catalon).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

1. Mudhu

2. Uma

3. Uma

4. Vasavi

5. K. Bakar

6. R. Sindhu

7. Shrey

8. B. Bolu

9. AD

10. Lanya

11. Rupa

12. Gang

13. Swarna

14. N. Arul

B.Tech. CSE (AI & ML) L T P C
III Year - II Semester 3 0 0 3

INFORMATION RETRIEVAL SYSTEMS (Professional Elective – II)
(CSE(AI&ML))

Prerequisites:

1. Data Structures

Course Objectives:

- To learn the concepts and algorithms in Information Retrieval Systems
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

Course Outcomes:

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.
- Demonstrate teamwork, documentation, and communication in IR system development

UNIT - I:

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses
Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT - II:

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT - III:

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT - IV:

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search,

1. *Mushtaq*

2. *Vishu*

3. *Vishu*

Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext
Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT - V:

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

TEXT BOOKS:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer.

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval by Yates and Neto Pearson Education.

1. Mueslin

2. Vaha

3. White

4. Vasari

5. K. Becker

6. R. Sindman

7. Shup

8. B. Balerist

9. JD

10. Lange

11. Rupa

12. Gump

13. Swarna

14. N. Muf

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III Year - II Semester 3 0 0 3

PATTERN RECOGNITION (Professional Elective – II)
(CSE(AI&ML))

Prerequisites:

1. Programming for problem solving
2. Computer Oriented Statistical Methods

Course Objectives

- Introducing fundamental concepts, theories, and algorithms for pattern recognition and machine learning.

Course Outcomes:

- Understand the importance of pattern recognition and its representation
- Analyze the variants of NN algorithm
- Understand the necessity of Hidden markov models, decision tree and SVM for classification
- Understand different types of clustering algorithms
- Solving real-world pattern recognition problems like handwritten digit recognition.

UNIT - I:

Introduction: Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

UNIT - II:

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm, use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

UNIT - III:

Hidden Markov Models: Markov Models for Classification, Hidden Markov Models, Classification using HMMs. **Decision Trees:** Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

UNIT - IV:

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions,

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Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

UNIT - V:

Clustering: Importance of clustering, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

TEXT BOOKS:

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Springer Pub, 1st Ed.

REFERENCE BOOKS:

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. PrenticeHall Pub.

1. Murty

2. Vasani

3. Devi

4. Vasani

5. H. Bakken

6. R. Sindhu

7. Devi

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B.Tech. CSE (AI & ML) L T P C

III Year - II Semester 3 0 0 3

COMPUTER VISION AND ROBOTICS (Professional Elective – II)

(CSE(AI&ML))

Prerequisites:

1. Linear Algebra and Probability.

Course Objectives:

- To understand the Fundamental Concepts Related To sources, shadows and shading
- To understand the The Geometry of Multiple Views

Course Outcomes:

- Implement fundamental image processing techniques required for computer vision
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques and Implement motion related techniques.
- Develop applications using computer vision techniques.

UNIT - I:

CAMERAS: Pinhole Cameras

Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases

Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models

Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

UNIT - II:

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates

Edge Detection: Noise, Estimating Derivatives, Detecting Edges

Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT - III:

The Geometry of Multiple Views: Two Views

Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras

Segmentation by Clustering: Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image

1. Murugesu

2. Vishu

3. Vishu

Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering

UNIT - IV:

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations

Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization

UNIT - V:

Introduction to Robotics: Social Implications of Robotics, Brief history of Robotics, Attributes of hierarchical paradigm, Closed world assumption and frame problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential fields and Perception

Common sensing techniques for Reactive Robots: Logical sensors, Behavioural Sensor Fusion, Pro- prioceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press

REFERENCE BOOKS:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press
3. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.

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B.Tech. L T P C
III Year - II Semester 3 0 0 3

DATA WAREHOUSING AND BUSINESS INTELLIGENCE

(Professional Elective – II)

(CSE(AI&ML))

Course Objectives:

- This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used by businesses to drive high-level decision making
- Students will learn how to design and create a data warehouse, and how to utilize the process of extracting, transforming, and loading (ETL) data into data warehouses.

Course Outcomes:

- Understand architecture of data warehouse and OLAP operations.
- Understand Fundamental concepts of BI
- Application of BI Key Performance indicators
- Understand Utilization of Advanced BI Tools and their Implementation.
- Implementation of BI Techniques and BI Ethics.

UNIT - I:

Data Warehouse, Data Warehouse Modelling, OLAP operations, Data Qube Computation methods

UNIT - II:

Business Intelligence Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT - III:

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business Intelligence-Value driven and Information use.

UNIT - IV:

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT - V:

Business Intelligence and integration implementation-connecting in BI systems-

1. Murthy

2. Vijay

3. Vijay

Issues of legality-Privacy and ethics- Social networking and BI.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier, 4th Edition.
2. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.

REFERENCE BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence. Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.
4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)]
5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007
6. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.
7. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

1. Murugesu

2. Datta

3. Dhill

4. Vasani 5. H. Baker 6. R. Sindhur 7. Rupa 8. B. Balakrishna

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B.Tech. CSE (AI & ML) L T P C
III Year - II Semester 3 0 0 3

FUNDAMENTALS OF AI (Open Elective – I)
(CSE(AI&ML))

Course Objectives:

- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

Course Outcomes:

- Gain the knowledge of what is AI, risks and benefits of AI, limits of AI and the ethics involved in building an AI application.
- Understand the nature of environments and the structure of agents.
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique
- Gain an understanding of the applications of AI

UNIT - I:

Foundations of AI: Introduction to AI, History of AI, Strong and Weak AI, The State of the Art, Risks and Benefits of AI

Philosophy, Ethics and Safety of AI: The Limits of AI, Machine thinking capability, The Ethics of AI

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT - II:

Solving Problems by Searching: Problem – Solving Agents

Uninformed Search Strategies: Best-First Search, Breadth-First Search, Uniform-Cost Search, Depth-First Search, Iterative Deepening Search and Bidirectional Search

Informed Search Strategies: Greedy Best-First Search, A* Search

UNIT - III:

Logical Agents: Knowledge-based agents, Propositional Logic, Propositional Theorem Proving

First-Order Logic: Syntax and Semantics of First-Order Logic

Inference in First-Order Logic: Propositional Vs. First-Order Inference, Unification and First-Order Inference, Forward Chaining, Backward Chaining

1. MuekRanu

2. Vana

3. Vana

Knowledge Representation: Ontological Engineering, Categories and Objects, Events

UNIT - IV:

Quantifying Uncertainty: Basic Probability Notation, Inference Using Full-Joint Distributions, Independence, Bayes' Rule and its Use, Naive Bayes Models

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The semantics of Bayesian Networks, Exact Inference in Bayesian Networks

UNIT - V:

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Model Selection, Linear Regression and Classification, Ensemble Learning

Natural Language Processing: Language Models, Grammar, Parsing, Complications of Real Natural Language, Natural Language Tasks

Robotics: Robots, Robot Hardware, Kind of Problems solved, Application Domains

Computer Vision: Simple Image Features, Using Computer Vision

TEXT BOOKS:

1. "Artificial Intelligence a Modern Approach", Fourth Edition, Stuart J. Russell & Peter Norvig – Pearson.

REFERENCE BOOKS:

1. "Artificial Intelligence", Elaine Rich, Kevin Knight & Shivashankar B Nair – McGraw Hill Education.
2. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
3. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
4. Artificial Intelligence, Shivani Goel, Pearson Education.
5. Artificial Intelligence and Expert systems – Patterson, Pearson Education

1. Murthy

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13. Swamy

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III Year - II Semester 3 0 0 3

MACHINE LEARNING BASICS (Open Elective – I)
(CSE(AI&ML))

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

Course Outcomes:

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy
- Demonstrate teamwork, documentation, and communication in ML-based projects

UNIT - I:

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

UNIT - II:

Multi-layer Perceptron– Going Forwards –Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice –Examples of using the MLP–Overview– Deriving Back-Propagation

UNIT - III:

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

UNIT - IV:

Support Vector Machines

Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

1. Murthy

2. Uma

3. Uma

UNIT - V:

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Hidden Markov Models

TEXT BOOKS:

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

REFERENCE BOOKS:

1. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
4. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

1. Mitchell

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6. R. Sridhar

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III Year - II Semester

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NATURAL LANGUAGE PROCESSING LAB

Course Objectives:

- To Develop and explore the problems and solutions of NLP

Course Outcomes: The student will learn

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammar.
- Knowledge on NLTK Library implementation
- Work on strings and trees, and estimate parameters using supervised and unsupervised training methods.

List of Experiments:

1. Write a Python Program to perform following tasks on text a) Tokenization b) Stop word Removal
2. Write a Python program to implement Porter stemmer algorithm for stemming
3. Write Python Program for a) Word Analysis b) Word Generation
4. Create a Sample list for at least 5 words with ambiguous sense and Write a Python program to implement WSD
5. Install NLTK tool kit and perform stemming
6. Create Sample list of at least 10 words POS tagging and find the POS for any given word
7. Write a Python program to a) Perform Morphological Analysis using NLTK library b) Generate n-grams using NLTK N-Grams library c) Implement N-Grams Smoothing
8. Using NLTK package to convert audio file to text and text file to audio files..

Text Books:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Oreilly Practical natural Language Processing, A Comprehensive Guide to Building Real World NLP Systems.
3. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

Reference Books:

1. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

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5. Ramesh

6. Lasya

7. Arjun

8. Tarun

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B.Tech. CSE(AI&ML)

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III Year - II Semester

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DATA ANALYTICS LAB**Course Objectives:**

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- Introduce visual perception and core skills for visual analysis
- To understand the various search methods and visualization techniques.

Course Outcomes: The student will learn

- Understand linear regression and logistic regression
- Understand the functionality of different classifiers
- Implement visualization techniques using different graphs
- Apply descriptive and predictive analytics for different types of data
- Understand various Data Sources

List of Experiments:

1. Data Preprocessing
 - a. Handling missing values
 - b. Noise detection removal
 - c. Identifying data redundancy and elimination
2. Implement any one imputation model
3. Implement Linear Regression
4. Implement Logistic Regression
5. Implement Decision Tree Induction for classification
6. Implement Random Forest Classifier
7. Implement ARIMA on Time Series data
8. Object segmentation using hierarchical based methods
9. Perform Visualization techniques (types of maps - Bar, Column, Line, Scatter, 3D Cubes etc)
10. Perform Descriptive analytics on healthcare data
11. Perform Predictive analytics on Product Sales data
12. Apply Predictive analytics for Weather forecasting.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman
Milliway Labs Jeffrey D Ullman Stanford Univ.

1. Kumar 2. Dima 3. J 4. ABIL
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III Year - II Semester

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Industrial Oriented Mini Project/ Internship/Skill Development Course (DevOps)
(CSE(AI&ML))**Course Objectives:**

- Develop a sustainable infrastructure for applications and ensure high scalability. DevOps aims to shorten the software development lifecycle to provide continuous delivery with high-quality.

Course Outcomes:

- Understand the need of DevOps tools
- Understand the environment for a software application development
- Apply different project management, integration and development tools
- Use Selenium tool for automated testing of application.
- Analyze and reflect on the internship experience to identify areas of personal and professional growth

List of Experiments

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application for exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

TEXT BOOKS:

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.

REFERENCE BOOKS:

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

1. Muneet Borus

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III Year - II Semester

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ENVIRONMENTAL SCIENCE

(Common for ECE, IT, CSE, CSE(DS), CSE(AI&ML))

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

Course Outcomes:

1. Understand the structure, function, and significance of ecosystems, including energy flow, biogeochemical cycles, and biodiversity conservation through field experiences.
2. Analyze the classification, utilization, and sustainable management of natural resources, along with alternative energy options.
3. Evaluate biodiversity at genetic, species, and ecosystem levels, its values, threats, and conservation methods under national and international frameworks.
4. Identify types, sources, and impacts of environmental pollution, and apply suitable control technologies while assessing global environmental challenges and protocols.
5. Interpret environmental policies, legislation, and the EIA process to propose management plans addressing contemporary environmental and sustainability issues.

UNIT-I:

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio-magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II :

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies

UNIT - III :

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act

UNIT - IV :

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and

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types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment, Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/ Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V :

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA:EIA structure, methods of baseline data acquisition. Over view on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

Text Books :

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

Reference Books :

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

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8) *Dyer*

9) *P. Bannell*

10) *Swift*

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Annexure-IX

B.Tech.

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IV B.Tech.-I Semester

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DEEP LEARNING

(CSE(AI & ML))

Course Objectives:

- To understand deep Learning algorithms and their applications in real-world data

Course Outcomes:

- Understand machine learning basics and neural networks
- Understand optimal usage of data for training deep models
- Apply CNN and RNN models for real-world data
- Evaluate deep models
- Develop deep models for real-world problems

UNIT - I:**Machine Learning Basics**

Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning

Deep Feedforward Networks Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT - II:**Regularization for Deep Learning**

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier, Optimization for Training Deep Models, Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates

UNIT - III:**Convolutional Networks**

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised

1. *Murugesu*2. *Vanna*3. *David*

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UNIT - IV:

Recurrent and Recursive Nets

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory

UNIT - V:

Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

REFERENCE BOOKS:

1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop. C.M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press, 2013.
6. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

1. Mueker

2. Bha

3. Idur

4. Vasari

5. K. Bha

6. R. Sindhu

7. Shrey

8. B. Bellur

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B.Tech. CSE (AI & ML)

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IV B.Tech.-I Semester

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NATURE INSPIRED COMPUTING

Course Objectives:

- Knowledge on significance of evolutionary computing, neuro computing and swarm intelligence

Course Outcomes:

- Familiar with Evolutionary Computing algorithms
- Understand scope of neurocomputing
- Compare different Ant Colony Optimization algorithmic models.
- Understand the scope of artificial immune systems
- Tackle different real world problems

UNIT - I:

Evolutionary Computing

Problem Solving as a Search Task, Hill Climbing and Simulated Annealing, Evolutionary Biology, Evolutionary Computing, The Other Main Evolutionary Algorithms, From Evolutionary Biology to Computing, Scope of Evolutionary Computing

UNIT - II:

Neurocomputing

The Nervous System, Artificial Neural Networks Typical ANNS and Learning Algorithms, From Natural to Artificial Neural Networks, Scope of Neurocomputing

UNIT - III:

Neurocomputing

The Nervous System, Artificial Neural Networks, Typical ANNS and Learning Algorithms, From Natural to Artificial Neural Networks, Scope of Neurocomputing

UNIT - IV:

Immunocomputing

The Immune System, Artificial Immune Systems, Bone Marrow Models, Negative Selection Algorithms, Clonal Selection and Affinity Maturation, Artificial Immune Networks, From Natural to Artificial Immune Systems, Scope of Artificial Immune Systems

UNIT - V:

Case Studies- Bioinformatics, Information Display

1. Mueksoo

2. Vanna

3. Vanna

TEXT BOOKS:

1. Leandro Nunes de Castro - " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
2. Albert Y.Zomaya - "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006

REFERENCE BOOKS:

1. Floreano, D. and C. Mattiussi -"Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies" IT Press, 2008
2. Marco Dorigo, Thomas Stutzle -"Ant Colony Optimization", Prentice Hall of India, New Delhi, 2005
3. Vinod Chandra S S, Anand H S - "Machine Learning: A Practitioner's Approach", Prentice Hall of India, New Delhi, 2020

1. Микро

2. Other

3. Unit

4 Vasari

5 K. Bakken

6 R-sindhu 7 ~~Deep~~

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14. N. J. J.

B.Tech. CSE(AI&ML)

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IV Year-I Semester

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INTERNET OF THINGS (Professional Elective – III)

Prerequisite: Computer organization, Computer Networks

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes: Upon completing this course, the student will be able to:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models. Compare and contrast the deployment of smart objects the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Identify the applications of IoT in Industry

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates Domain Specific IoTs – Home automation, Environment, Agriculture, Health and Lifestyle.

UNIT-II:

IoT and M2M – M2M, Difference between IoT and M2M, SDN and NFV for IoT, IoT System Management with NETCOZF, YANG- Need for IoT system Management, Simple Network management protocol, Network operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

UNIT-III:

IoT Systems – Logical design using Python-Introduction to Python – Python Data types & Data structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations, Classes, Exception, Python packages of Interest for IoT

UNIT-IV:

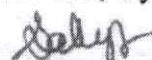
IoT Physical Devices and Endpoints - Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry PI with Python, Other IoT devices.

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs, WAMP-AutoBahn for IoT, Xively Cloud for IoT, Python web

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application framework -Django, Designing a RESTful web API

UNIT-V:

Case studies- Home Automation, Environment-weather monitoring-weather reporting- air pollution monitoring, Agriculture..

Text Books:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.

Reference Books:

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

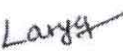
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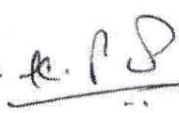
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IV Year – I Semester

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DATA MINING (Professional Elective–III)
(CSE(AI & ML))**Prerequisites:**

1. Database Management System
2. Probability and Statistics

Course Objectives:

- Students will become acquainted with both the strengths and limitations of various data mining techniques like Association, Classification, Cluster and Outlier analysis.

Course Outcomes:

- Understand the need of data mining and pre-processing techniques.
- Perform market basket analysis using association rule mining.
- Utilize classification techniques for analysis and interpretation of data.
- Identify appropriate clustering and outlier detection techniques to handle complex data.
- Understand the mining of data from web, text and time series data.

UNIT - I:**Introduction to Data Mining:**

What Data mining? Kinds of Data, Knowledge Discovery process, Data Mining Functionalities, Kinds of Patterns, Major Issues in Data Mining, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity, Data Pre-processing: Major Tasks in Data Pre-processing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT - II:

Association Analysis: Basic Concepts, Market Basket Analysis, Apriori Algorithm, FP-growth, From Association Analysis to Correlation Analysis, Pattern Mining in Multilevel Associations and Multidimensional Associations.

UNIT - III:

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Ensemble Methods, Multilayer Feed-Forward Neural Network, Support Vector Machines, k-Nearest-Neighbor Classifiers.

1. Muebhu

2. Vana

3. Vani

UNIT - IV:

Cluster Analysis: Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods-k-Means, k-Medoids, Hierarchical Methods-AGENES, DIANA, BIRCH, Density-Based Method-DBSCAN, Outlier Analysis: Types of Outliers, Challenges of Outlier Detection, and Overview of Outlier Detection Methods

UNIT - V:

Advanced Concepts: WebMining- Web Content Mining, Web Structure Mining, Web Usage Mining, Spatial Mining- Spatial Data Overview, Spatial Data Mining Primitives, Spatial Rules, Spatial Classification Algorithm, Spatial Clustering Algorithms, Temporal Mining- Modeling Temporal Events, Time Series, Pattern Detection, Sequences, Temporal Association Rules.

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber, Jian Pei., Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufmann/Elsevier, 2012.
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education, India, 2006.

REFERENCEBOOKS:

1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne and Vipin Kumar, Introduction to Data Mining, 2nd Edition, Pearson Education India, 2021.
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India, 2007.

1. Murkano

2. Vana

3. Vani

4. Vana

5. K. Baker

6. R. Sindhu

7. Deep

8. B. Balakrishna

9. J. D.

10. Jaye

11. Rupa

12. Ganga

13. Swapna

14. N. Jyoti

B.Tech.

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IV Year – I Semester

3 0 0 3

SCRIPTING LANGUAGES

(CSE(AI&ML))

Prerequisites:

1. A course on "Computer Programming and Data Structures".
2. A course on "Object Oriented Programming Concepts".

Course Objectives:

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

Course Outcomes:

- Differentiate Language Paradigms
- Analyze Language Strengths and Weaknesses
- Develop Proficiency in Ruby and Web Applications
- Master Perl Programming Techniques
- Implement Applications using Tcl and Tk

UNIT - I:

Introduction: Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services

RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT - II:

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

UNIT - III:**Introduction to PERL and Scripting**

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT - IV:**Advanced perl**

Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

1. MueBuo

2. Bha

3. Dui

UNIT - V:

TCL

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk

Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pragmatic Programmers guide by Dabve Thomas Second edition

REFERENCEBOOKS:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

1. MueRanu

2. Vaha

3. Vdu

4. Vasari

5. H. De Kru

6. R. Sindhuan

7. Ray

8. B. Ball H. S. J

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IV Year – I Semester

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MOBILE APPLICATION DEVELOPMENT (Professional Elective–III)

(CSE(AI&ML))

Prerequisites:

1. Acquaintance with JAVA programming
2. A Course on DBMS

Course Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improve their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

Course Outcomes:

- Understand the fundamentals of the Android operating system
- Design and develop functional user interfaces
- Implement application navigation and communication
- Manage and persist application data
- Utilize relational database technology within Android applications

UNIT - I:

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II:

Android User Interface: Measurements – Device and pixel density independent measuring unit-s Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

1. Murugan2. Aravind3. Adarsh

UNIT - III:

Intents and Broadcasts: Intent–Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV:

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT - V:

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

Text Books:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.

REFERENCE BOOKS:

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

1. Muneer

2. V. D. D. D.

3. D. D. D.

4. Vasavi

5. H. Bakran

6. R. Sindhu

7. D. D. D.

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10. J. J. J.

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IV Year – I Semester

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CLOUD COMPUTING (Professional Elective–III)

(CSE (AI & ML))

Prerequisites:

1. A course on “Computer Networks”.
2. A course on “Operating System”.

Course Objectives:

- This course provides an insight into cloud computing.
- Topics covered include- Cloud Computing Architecture, Deployment Models, Service Models, Technological Drivers for Cloud Computing, Networking for Cloud Computing and Security in Cloud Computing.

Course Outcomes:

- Understand different computing paradigms and potential of the paradigms and specifically cloud computing
- Understand cloud service types, cloud deployment models and technologies supporting and driving the cloud
- Acquire the knowledge of programming models for cloud and development of software application that runs the cloud and various services available from major cloud providers
- Understand the security concerns and issues in cloud computing
- Acquire the knowledge of advances in cloud computing.

UNIT - I:

Computing Paradigms, Cloud Computing Fundamentals, Cloud Computing Architecture and Management

UNIT - II:

Cloud Deployment Models, Cloud Service Models, Technological Drivers for Cloud Computing: SOA and Cloud, Multicore Technology, Web 2.0 and Web 3.0, Pervasive Computing, Operating System, Application Environment

UNIT - III:

Virtualization, Programming Models for Cloud Computing: MapReduce, Cloud Haskell, Software Development in Cloud

UNIT - IV:

Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs, Cloud Service Providers

UNIT - V:

Security in Cloud Computing, and Advanced Concepts in Cloud Computing

1. *MapReduce*2. *Virtualization*3. *Networking*

TEXT BOOKS:

1. Chandrasekaran, K. Essentials of cloud computing. CRC Press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

1. Muep

2. Vana

3. Vani

4. Vasari

5. Ko Baker

6. R. Sindhu

7. Devi

8. B. Ball (1955)

9. JD

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12. Gina

13. Swagner

14. N. J. J.

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QUANTUM COMPUTING (Professional Elective – IV)
(CSE (AI & ML))

Course Objectives:

- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

Course Outcomes:

- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand The Impact of Quantum Computing on Cryptography
- Comprehend how an agent learns and generalizes from examples, and understand its relationship to dynamic programming.

UNIT - I:

History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT - II:

Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. **Background Physics:** Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. **Background Biology:** Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT - III:

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere

Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT - IV:

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT - V:

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. **Quantum Information and Cryptography:** Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

1. Mukherjee

2. Dutta

3. Das

TEXT BOOKS:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge.

REFERENCE BOOKS:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II.
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

1. Murano

2. Vanna

3. Vani

4. Vasari

5. K. Bakur

6. R. Sindhu

7. Shree

8. B. Bala

9. DB

10. Jaya

11. Rupa

12. Ena

13. Swarna

14. N. Jyoti

B.Tech.

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IV Year I Sem.

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EXPERT SYSTEMS (Professional Elective – IV)
(CSE (AI & ML))**Course Objectives:**

- Understand the basic techniques of artificial intelligence.
- Understand the Non-monotonic reasoning and statistical reasoning.

Course Outcomes:

- Apply the basic techniques of artificial intelligence.
- Discuss the architecture of an expert system and its tools.
- Understand the importance of building an expert systems
- Understand various problems with an expert systems
- Explore intelligent expert systems through structured lifecycle. Analyze intelligent expert systems using fuzzy logic and hybrid models

UNIT - I:

Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic search techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game trees, Min-max algorithms, game playing – Alpha-beta pruning.

UNIT - II:

Knowledge representation issues predicate logic – logic programming Semantic nets-frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.

UNIT - III:

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

UNIT - IV:

Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

UNIT - V:

Building an Expert System: Expert system development, Selection of the tool, Acquiring Knowledge, Building process.

Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development.

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2. Vaha

3. Adv

TEXT BOOKS:

1. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, New Delhi.
2. Waterman D.A., "A Guide to Expert Systems", Addison Wesley Longman.

REFERENCE BOOKS:

1. Stuart Russel and other Peter Norvig, "Artificial Intelligence – A Modern Approach", Prentice-Hall,
2. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley,
3. Patterson, Artificial Intelligence & Expert System, Prentice Hall India, 1999.
4. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley,
5. Weiss S.M. and Kulikowski C.A., "A Practical Guide to Designing Expert Systems", Rowman & Allanheld, New Jersey.

1. Mukherjee

2. Vohra

3. Vohra 4. Varian

5. K. Becker

6 R. Sindhu

7. ~~Shree~~

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13. Swarna

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IV Year I Sem. 3 0 0 3

SEMANTIC WEB (Professional Elective – IV)
(CSE (AI & ML))

Course Objectives:

- Introduce Semantic Web Vision and learn Web intelligence
- Understanding about XML, RDF, RDFS, OWL
- Querying Ontology and Ontology Reasoning
- To learn Semantic Web Applications, Services and Technology
- To learn Knowledge Representation for the Semantic Web

Course Outcomes:

- Understand the characteristics of the semantic web technology
- Understand the concepts of Web Science, semantics of knowledge resource and ontology
- Describe logic semantics and inference with OWL.
- Use ontology engineering approaches in semantic applications
- Learn about web graph processing for various applications such as search engine, community detection

UNIT - I:

Introduction: Introduction to Semantic Web, the Business Case for the Semantic Web, XML and Its Impact on the Enterprise.

UNIT - II:

Web Services: Uses, Basics of Web Services, SOAP, UDDI, Orchestrating Web Services, Securing Web Services, Grid Enabled and Semantic Web of Web Services.

UNIT - III:

Resource Description Framework: Features, Capturing Knowledge with RDF.

XML Technologies: XPath, The Style Sheet Family: XSL, XSLT, and XSL FO, XQuery, XLink, XPointer, XInclude, XMLBase, XHTML, XForms, SVG.

UNIT - IV:

Taxonomies and Ontologies: Overview of Taxonomies, Defining the Ontology Spectrum, Topic Maps, Overview of Ontologies, Syntax, Structure, Semantics, and Pragmatics, Expressing Ontologies Logically, Knowledge Representation.

UNIT - V:

Semantic Web Application: Semantic Web Services, e-Learning, Semantic Bioinformatics, Enterprise Application Integration, Knowledge Base.

Semantic Search Technology: Search Engines, Semantic Search, Semantic Search Technology, Web Search Agents, Semantic Methods, Latent Semantic Index Search,

1. MueRono

2. Vaha

3. Vaha

TAP, Swoogle

TEXT BOOKS:

1. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management by Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, Wiley Publishing, Inc.
2. Peter Mika, Social Networks and the Semantic Web, Springer

REFERENCE BOOKS:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley Interscience
2. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management by Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, Wiley Publishing, Inc.
3. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
4. Semantic Web and Semantic Web Services - Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
5. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
6. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.

1. Markus

2. Baker

3. David

4. Vasari

5. H. Baker

6. R. Sindhu

7. Stacy

8. D. Baker (1957)

9. JD

10. Jays

11. Ryan

12. Qu

13. Quapra

14. N. Aug.

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GAME THEORY (Professional Elective – IV)
(CSE (AI & ML))

Course Objectives:

- The course will explain in depth the standard equilibrium concepts (such as Nash equilibrium, Subgame-Perfect Nash Equilibrium, and others) in Game Theory.

Course Outcomes:

- Understand the basic concepts of game theory and solutions
- Understand different types of equilibrium interpretations
- Understand and analyze knowledge and solution concepts
- Analyze extensive games with perfect information
- Find dominant strategy equilibrium, pure and mixed strategy Nash equilibrium

UNIT - I:

Introduction- Game Theory, Games and Solutions, Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation

Nash Equilibrium- Strategic Games, Nash Equilibrium, Examples, Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information

UNIT - II:

Mixed, Correlated, and Evolutionary Equilibrium -Mixed Strategy Nash Equilibrium, Interpretations of Mixed Strategy Nash Equilibrium, Correlated Equilibrium, Evolutionary Equilibrium

Rationalizability and Iterated Elimination of Dominated Actions- Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions

UNIT - III:

Knowledge and Equilibrium -A Model of Knowledge Common Knowledge, Can People Agree to Disagree? Knowledge and Solution Concepts, The Electronic Mail Game

UNIT - IV:

Extensive Games with Perfect Information -Extensive Games with Perfect Information, Subgame Perfect Equilibrium, Two Extensions of the Definition of a Game, The Interpretation of a Strategy, Two Notable Finite Horizon Games, Iterated Elimination of Weakly Dominated Strategies

Bargaining Games -Bargaining and Game Theory, A Bargaining Game of Alternating

1. Murugan

2. Vignan

3. Vignan

Offers, Subgame Perfect Equilibrium, Variations and Extensions

UNIT - V:

Repeated Games - The Basic Idea Infinitely Repeated Games vs. Finitely Repeated Games, Infinitely Repeated Games: Definitions, Strategies as Machines, Trigger Strategies: Nash Folk Theorems, Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion, Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion, Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion, The Structure of Subgame Perfect Equilibria Under the Discounting Criterion, Finitely Repeated Game

TEXT BOOKS:

1. A course in Game Theory, M. J. Osborne and A. Rubinstein, MIT Press.

REFERENCE BOOKS:

1. Game Theory, Roger Myerson, Harvard University Press.
2. Game Theory, D. Fudenberg and J. Tirole, MIT Press.
3. Theory of Games and Economic Behavior, J. von Neumann and O. Morgenstern, New York: John Wiley and Sons.
4. Games and Decisions, R.D. Luce and H. Raiffa, New York: John Wiley and Sons.
5. Game Theory, G. Owen, 2nd Edition, New York: Academic Press.

1. Myerson

2. Osborne

3. Osborne

4. Varian

5. H. Becker

6. R. Sindhua

7. Shue

8. B. Bakhtin

9. Shue

10. Jay

11. Paper

12. Shue

13. Shue

14. N. Shue

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MOBILE COMPUTING (Professional Elective – IV)
(CSE (AI & ML))

Prerequisites:

1. Computer Networks
2. Distributed Systems / Distributed Operating Systems

Course Objectives:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations, typical mobile networking infrastructure through a popular GSM protocol, the issues of various layers of mobile networks and their solutions.

Course Outcomes:

- Understand the concept of mobile computing paradigm, its novel applications and limitations.
- Analyze and develop new mobile applications
- Understand the issues of various layers of mobile networks and their solutions.
- Classify data delivery mechanisms
- Understand the principles and challenges of Mobile Ad hoc Networks (MANETs)

UNIT - I:

Introduction

Mobile Communications, Mobile Computing–Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT - II:

(Wireless) Medium Access Control (MAC)

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

Mobile Network Layer

IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT - III:

Mobile Transport Layer

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other

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Transport Layer Protocols for Mobile Networks.

Database Issues

Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT - IV:

Data Dissemination and Synchronization

Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols

UNIT - V:

Mobile Ad hoc Networks (MANETs)

Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery.

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772

REFERENCE BOOKS:

1. Asoke K Talukder, Hasan Ahmed, Roopa Yavagal Mobile Computing: Technology, Applications and Service Creation, McGraw Hill Education.

1. Murken

2. V. K. R.

3. Chitra

4. Vasavi

5. K. R. K.

6. R. Sindhu

7. Shrey

8. B. Balakrishna

9. JB

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11. Rupa

12. Chitra

13. Swarna

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IV Year - I Semester

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INTRODUCTION TO NATURAL LANGUAGE PROCESSING**(Open Elective – II)**

(CSE (AI & ML))

Prerequisites:

1. Data structures and compiler design

Course Objectives:

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms; and design different language modeling Techniques.
- Develop and evaluate language models, understanding their role in applications like machine translation and information retrieval.

UNIT - I:

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

UNIT - II:

Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

UNIT - III:

Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues

Semantic Parsing I: Introduction, Semantic Interpretation, System Paradigms, Word Sense

UNIT - IV:

Semantic Parsing II: Predicate-Argument Structure, Meaning Representation Systems

UNIT - V:

Language Modeling: Introduction, N-Gram Models, Language Model

1. *Meer Rana*2. *Vishu*3. *Vishu*

Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication

REFERENCE BOOKS:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

1. Murken

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5. K. Baker

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IV Year - I Semester

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AI APPLICATIONS (Open Elective – II)
(CSE (AI & ML))

Prerequisites:

1. Fundamentals of AI

Course Objectives:

- To give deep knowledge of AI and how AI can be applied in various fields to make life easy.

Course Outcomes:

- Correlate AI and solutions to modern problems.
- Use of AI in business applications
- Application of AI in manufacturing automation
- Use of AI in streaming of data and Network applications
- Formulate AI and data analytics strategies for IoT-enabled industrial applications, such as Siemens' "Internet of Trains" and Tesla's intelligent vehicles

UNIT - I:

Alibaba: Using Artificial Intelligence To Power The Retail And Business-To-Business Services Of The Future

Amazon: Using Deep Learning To Drive Business Performance

UNIT - II:

McDonald's: Using Robots And Artificial Intelligence To Automate Processes

Walmart: Using Artificial Intelligence To Keep Shelves Stacked And Customers Happy

UNIT - III:

LinkedIn: Using Artificial Intelligence To Solve The Skills Crisis

Netflix: Using Artificial Intelligence To Give Us A Better TV Experience

UNIT - IV:

Salesforce: How Artificial Intelligence Helps Businesses Understand Their Customers

Uber: Using Artificial Intelligence To Do Everything

UNIT - V:

Siemens: Using Artificial Intelligence And Analytics To Build The Internet Of Trains

Tesla: Using Artificial Intelligence To Build Intelligent Cars

Text Books:

1. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems, Bernard Marr, Matt Ward, Wiley.

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IV Year - I Semester

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PROFESSIONAL PRACTICE, LAW & ETHICS
(Common for CSE(AI&ML)& ECE)**Course Objectives:**

- Understand professional and engineering ethics, responsibilities, and governance mechanisms.
- Learn fundamentals of contract law and special contracts.
- Gain knowledge of arbitration and ADR mechanisms.
- Understand arbitration procedures and dispute resolution systems.
- Understand intellectual property laws and their protection in India.

Course Outcomes: The student will learn

- The concept of professional ethics, ethical responsibilities of engineers, and mechanisms to maintain professional integrity.
- To analyze and apply principles of contract law including formation, performance, and remedies for breach of contract in engineering practice.
- To interpret and differentiate among arbitration, conciliation, and alternative dispute resolution methods as per the Arbitration Act 1996.
- Examine labor laws, employment acts, and safety regulations related to construction and infrastructure projects.
- Understand and explain intellectual property rights (IPR), copyright, trademarks, patents, and design laws relevant to engineering innovations.

UNIT - I: Professional Practice and Ethics

Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility, Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. Introduction to GST- Various Roles of Various Stakeholders.

UNIT - II: Law of Contract

Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of Goods Act - 1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

UNIT - III: Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system

Arbitration - meaning, scope and types - distinction between laws of 1940 and 1996; UNCITRAL model law - Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration.

UNIT - IV: Arbitration agreements:

Essential and kinds, validity, reference and interim measures by court; Arbitration tribunal - appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalat's.

Unit V: Law relating to Intellectual property

Introduction - meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright - computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet - Remedies and procedures in India; Law relating to Patents under Patents Act, 1970.

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and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India;
Law relating to Patents under Patents Act, 1970.

TEXTBOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ravinder Kaur, Legal Aspects of Business, 4e, Cengage Learning, 2016

REFERENCE BOOKS:

1. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
2. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.
3. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers.

1. *Un*
2. *Prigdy*
3. *Sty*
4. S. Subassun
Sulbarie
5. Srichar
6. Sarja
7. Nimala
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9. K. Jaypry
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B.Tech.CSE(AI&ML)

IV Year-I Semester

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INTERNET OF THINGS LAB (Professional Elective – III)

Course Objectives

- To introduce the raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of distance sensor on IoT devices

Course Outcomes

- Ability to introduce the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor
- Get the skill to program using python scripting language which is used in many IoT devices

List of Experiments

1. Using Raspberry pi

- a. Calculate the distance using a distance sensor.
- b. Interface an LED and switch with Raspberry pi.
- c. Interface an LDR with Raspberry Pi.

2. Using Arduino

- a. Calculate the distance using a distance sensor.
- b. Interface an LED and switch with Arduino.
- c. Interface an LDR with Arduino
- d. Calculate temperature using a temperature sensor.

3. Using Node MCU

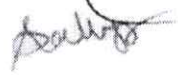
- a. Calculate the distance using a distance sensor.
- b. Interface an LED and switch with Raspberry pi.
- c. Interface an LDR with Node MCU
- d. Calculate temperature using a temperature sensor.

4. Installing OS on Raspberry Pi

- a. Installation using Pi Imager
- b. Installation using image file

- Downloading an Image
- Writing the image to an SD card
 - using Linux
 - using Windows
 - Booting up Follow the instructions given in the URL.

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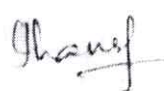
4. 

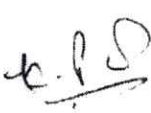
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<https://www.raspberrypi.com/documentation/computers/getting-started.html>

5. Accessing GPIO pins using Python

a) Installing GPIO Zero library. update your repositories list: install the package for Python 3:

b) Blinking an LED connected to one of the GPIO pin

c) Adjusting the brightness of an LED Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength

6. Create a DJANGO project and an app.

7. Create a DJANGO view for weather station REST API

8. Create DJANGO template

9. Configure MYSQL with DJANGO framework

Text Books:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

Reference Books:

1. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

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IV Year - I Semester

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DATA MINING LAB (Professional Elective – III)
(CSE (AI & ML))

Prerequisites:

1. A course on "Database Management System"

Course Objectives:

- The course is intended to obtain hands-on experience using data mining software.
- Intended to provide practical exposure of the concepts in data mining algorithms

Course Outcomes:

- Apply preprocessing statistical methods for any given raw data.
- Gain practical experience of constructing a data warehouse.
- Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
- Apply OLAP operations on data cube construction

List of Experiments: Experiments using Weka/ Pentaho/Python

1. Data Processing Techniques:
(i) Data cleaning (ii) Data transformation – Normalization (iii) Data integration
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
3. Data Warehouse schemas – star, snowflake, fact constellation
4. Data cube construction – OLAP operations
5. Data Extraction, Transformations & Loading operations
6. Implementation of Attribute oriented induction algorithm
7. Implementation of apriori algorithm
8. Implementation of FP – Growth algorithm
9. Implementation of Decision Tree Induction
10. Calculating Information gain measures
11. Classification of data using Bayesian approach
12. Classification of data using K – nearest neighbour approach
13. Implementation of K – means algorithm
14. Implementation of BIRCH algorithm
15. Implementation of PAM algorithm
16. Implementation of DBSCAN algorithm

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.

1. *Muller Rana*

2. *W. H. Kamber*

3. *W. H. Kamber*

2. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith-
Tata McGraw-Hill Edition, Tenth reprint 2007

REFERENCE BOOKS:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Anuj Karpatne, Introduction
to Data Mining, Pearson Education

1. Murken

2. Vaha

3. Chur

4. Vaer

5. H. Baker

6. R. Sindhu

7. Day

8. B. Bellman

9. DB

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IV Year - I Semester

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SCRIPTING LANGUAGES LAB (Professional Elective – III)

(CSE (AI & ML))

Prerequisites:

1. Any High level programming language (C, C++)

Course Objectives:

- To Understand the concepts of scripting languages for developing web based projects
- To understand the applications the of Ruby, TCL, Perl scripting languages

Course Outcomes:

- Ability to understand the differences between Scripting languages and programming languages
- Gain some fluency programming in Ruby, Perl, TCL

List of Experiments

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the users first and last name and print them in reverse order with a space between them
4. Write a Ruby script to accept a filename from the user print the extension of that
5. Write a Ruby script to find the greatest of three numbers
6. Write a Ruby script to print odd numbers from 10 to 1
7. Write a Ruby script to check two integers and return true if one of them is 20 otherwise return their sum
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100
9. Write a Ruby script to print the elements of a given array
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash
11. Write a TCL script to find the factorial of a number
12. Write a TCL script that multiplies the numbers from 1 to 10
13. Write a TCL script for sorting a list using a comparison function
14. Write a TCL script to (i) create a list (ii) append elements to the list (iii) Traverse the list (iv) Concatenate the list
15. Write a TCL script to comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.

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- a) Write a Perl script to find the largest number among three numbers.
 - b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
18. Write a Perl program to implement the following list of manipulating functions
- a) Shift
 - b) Unshift
 - c) Push
19. a) Write a Perl script to substitute a word, with another word in a string.
b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pragmatic Programmers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

1. Murken

2. Baker

3. David

4. Vasavi

5. H. Baker

6. R. Sindhu

7. Ray

8. B. Bakshi

9. JD

10. Jay

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IV Year - I Semester	0	0	2	1
MOBILE APPLICATION DEVELOPMENT LAB (Professional Elective – III) (CSE (AI & ML))				

Course Objectives:

- To learn how to develop Applications in an android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

Course Outcomes:

- Understand the working of Android OS Practically.
- Develop user interfaces.
- Develop, deploy and maintain the Android Applications.

List of Experiments

1. Create an Android application that shows Hello + name of the user and run it on an emulator.
(b) Create an application that takes the name from a text box and shows hello message along with the name entered in the text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Datepicker), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on the right fragment instead of the second screen with the back button. Use Fragment transactions and Rotation event listeners.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store usernames and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the

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dialog with a Login Failed message.

7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage, 2013.

REFERENCE BOOKS:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

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B.Tech. CSE (AI & ML)

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IV Year - I Semester

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CLOUD COMPUTING LAB (Professional Elective – III)
(CSE (AI & ML))**Course Objectives:**

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.

Course Outcomes:

- Understand various service types, delivery models and technologies of a cloud computing environment.
- Understand the ways in which the cloud can be programmed and deployed.
- Understand cloud service providers like Cloudsim, Globus Toolkit etc.
- Examine various programming paradigms suitable to solve real world and scientific problems using cloud services.

List of Experiments

1. Install Virtualbox/VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Create an Amazon EC2 instance and set up a web-server on the instance and associate an IP address with the instance.
4. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like word count.
9. Create a database instance in the cloud using Amazon RDS.
10. Create a database instance in the cloud using Google Cloud SQL

TEXT BOOKS:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

1. Murugesu

2. Vignan

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REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej
2. M. Goscinski, Wiley, 2011.
3. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
4. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

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SOCIAL NETWORK ANALYSIS (Professional Elective – V)
(CSE (AI & ML))

Prerequisites:

- Web Technologies
- Computer Networks
- Data Warehousing and Data Mining

Course Objectives:

- Understand the concepts of social media
- Learn the mechanisms for social network analysis
- Analysis of widely used services such as email, Wikis, Twitter, flickr, YouTube, etc.

Course Outcomes:

- Ability to construct social network maps easily
- Gain skills in tracking the content flow through the social media
- Understand NodeXL use to perform social network analysis
- Ability to construct the mapping message boards and secured communication.
- Ability to understand used services such as email, Wikis, Twitter, flickr, YouTube, etc.

UNIT - I

Introduction: Social Media and Social Networks

Social Media: New Technologies of Collaboration

Social Network Analysis: Measuring, Mapping, and Modelling collections of Connections.

UNIT - II

NodeXL, Layout, Visual Design, and Labelling, Calculating and Visualising Network Metrics, Preparing Data and Filtering, Clustering and Grouping.

UNIT - III

CASE STUDIES:

Email: The lifeblood of Modern Communication.

Thread Networks: Mapping Message Boards and Email Lists

Twitter: Conversation, Entertainment and Information

UNIT - IV

CASE STUDIES:

Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

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UNIT - V

CASE STUDIES:

You Tube: Contrasting Patterns of Content Interaction, and Prominence.

Wiki Networks: Connections of Creativity and Collaboration

TEXT BOOKS:

1. Hansen, Derek, Ben Sheiderman, Marc Smith, Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 2011.

REFERENCE BOOKS:

1. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability, Sybex, 2009.
2. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics, 1st Edition, MGH, 2011.

1. Marlow

2. Baker

3. Chen

4. Vasari

5. H. Baker & R. Sindhu

7. Dej

8. B. Baker

9. Dej

10. Jays

11. Rupa

12. Dej

13. Swaps

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IV Year - II Semester 3 0 0 3

FEDERATED MACHINE LEARNING (Professional Elective – V)

(CSE(AI&ML))

Prerequisites:

- The prerequisite knowledge for this course includes machine learning, basic computer systems and basic programming skills.

Course Objectives:

- Understand the key concepts and issues behind Federated Learning
- Get familiar with key theoretical results of Federated Learning

Course Outcomes:

- Understand the basics on privacy-preserving ML
- Analyze the key concepts of Distributed ML and FL
- Understand the key concepts and applications of Horizontal FL and Vertical FL
- Motivates the intensive mechanism design for FL
- Analyze the concepts of federated reinforcement learning

UNIT - I:

Introduction: Motivation, Federated Learning as a Solution, The Definition of Federated Learning, Categories of Federated Learning, Current Development in Federated Learning, Research Issues in Federated Learning, Open-Source Projects, Standardization Efforts, The Federated AI Ecosystem Background: Privacy-Preserving Machine Learning, PPML and Secure ML, Threat and Security Models, Privacy Threat Models, Adversary and Security Models, Privacy Preservation Techniques, Secure Multi-Party Computation, Homomorphic Encryption, Differential Privacy

UNIT - II:

Distributed Machine Learning: Introduction to DML, The Definition of DML, DML Platforms, Scalability-Motivated DML, Large-Scale Machine Learning, Scalability-Oriented DML Schemes, Privacy-Motivated DML, Privacy-Preserving Decision Trees, Privacy-Preserving Techniques, Privacy-Preserving DML Schemes, Privacy-Preserving Gradient Descent, Vanilla Federated Learning, Privacy-Preserving Methods

UNIT - III:

Horizontal Federated Learning: The Definition of HFL, Architecture of HFL, The Client- Server Architecture, The Peer-to-Peer Architecture, Global Model Evaluation, The Federated Averaging Algorithm, Federated Optimization, The FedAvg Algorithm, The Secured FedAvg Algorithm, Improvement of the FedAvg Algorithm, Communication Efficiency, Client Selection Vertical Federated Learning: The Definition of VFL, Architecture of VFL, Algorithms of VFL, Secure Federated Linear Regression, Secure Federated Tree-Boosting

1. *Murugan*

2. *Vignan*

3. *Vignan*

UNIT - IV:

Federated Transfer Learning: Heterogeneous Federated Learning, Federated Transfer Learning, The FTL Framework, Additively Homomorphic Encryption, The FTL Training Process, The FTL Prediction Process, Security Analysis, Secret Sharing-Based FTL Incentive Mechanism Design for Federated Learning: Paying for Contributions, Profit-Sharing Games, Reverse Auctions, A Fairness-Aware Profit Sharing Framework, Modeling Contribution, Modeling Cost, Modeling Regret, Modeling Temporal Regret, The Policy Orchestrator, Computing Payoff Weightage

UNIT - V:

Federated Learning for Vision, Language, and Recommendation: Federated Learning for Computer Vision, Federated CV, Federated Learning for NLP, Federated NLP, Federated Learning for Recommendation Systems, Recommendation Model, Federated Recommendation System

Federated Reinforcement Learning: Introduction to Reinforcement Learning, Policy, Reward, Value Function, Model of the Environment, RL Background Example, Reinforcement Learning Algorithms, Distributed Reinforcement Learning, Asynchronous Distributed Reinforcement Learning, Synchronous Distributed Reinforcement Learning, Federated Reinforcement Learning, Background and Categorization

TEXT BOOKS:

1. Federated Learning, Qiang Yang, Yang Liu, Yong Cheng, Yan Kang, Tianjian Chen, and Han Yu Synthesis Lectures on Artificial Intelligence and Machine Learning 2019.

1. Murthy

2. Vohra

3. Vohra

4. Vohra

5. K. Baka

6. R. Sindhu

7. Jey

8. B. Balaji

9. Jey

10. Jey

11. Rupa

12. Jey

13. Jey

14. N. Jey

B.Tech. L T P C
IV Year - II Semester 3 0 0 3

AUGMENTED REALITY & VIRTUAL REALITY (Professional Elective –V)
(CSE (AI & ML))

Course Objectives:

- Provide a foundation to the fast-growing field of AR and make the students aware of the various AR concepts.
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

Course Outcomes:

- Describe how AR systems work and list the applications of AR.
- Understand the software architecture of AR.
- Understand the Visual perception and rendering in VR
- Understand the interaction, auditory perception and rendering in VR
- Ability to understand the difference between Augmented and VR

UNIT - I:

Introduction to Augmented Reality: Augmented Reality - Defining augmented reality, history of augmented reality, Examples, Related fields

Displays: Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays

Tracking: Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

UNIT - II:

Computer Vision for Augmented Reality: Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Outdoor Tracking.

Interaction: Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaces on Real Surfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction

Software Architectures: AR Application Requirements, Software Engineering Requirements, Distributed Object Systems, Dataflow, Scene Graphs

UNIT - III:

Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception

The Geometry of Virtual Worlds: Geometric Models, Axis-Angle Representations of Rotation, Viewing Transformations

Light and Optics: Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

1. Murthy

2. Vignan

3. Vignan

UNIT - IV:

The Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR

Visual Perception: Visual Perception - Perception of Depth, Perception of Motion, Perception of Color
Visual Rendering: Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos

UNIT - V:

Motion in Real and Virtual Worlds: Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection

Interaction: Motor Programs and Remapping, Locomotion, Social Interaction

Audio: The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering

TEXT BOOKS:

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016

REFERENCE BOOKS:

1. Allan Fowler-AR Game Development I, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
5. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.

1. Muehlen

2. LaValle

3. David

4. Vasari

5. K. Becker

6. R. Sindhur

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B.Tech.

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IV Year - II Semester

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WEB SECURITY (Professional Elective –V)

(CSE (AI & ML))

Course Objectives:

- Give an Overview of information security Give an overview of Access control of relational databases

Course Outcomes: Students should be able to

- Understand the Web architecture and applications
- Understand client side and service side programming
- Understand how common mistakes can be bypassed and exploit the application
- Identify common application vulnerabilities
- Ability to understand providing the security to the web based data base.

UNIT - I:

The Web Security, The Web Security Problem, Risk Analysis and Best Practices
Cryptography and the Web: Cryptography and Web Security, Working Cryptographic
Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

UNIT - II:

The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft,
Web Server Security, Physical Security for Servers, Host Security for Servers, Securing
Web Applications

UNIT - III:

Database Security: Recent Advances in Access Control, Access Control Models for XML,
Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses
and OLAP Systems

UNIT - IV:

Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking
for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and
Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities and

UNIT - V:

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced
Location Based Access Control, Efficiently Enforcing the Security and Privacy Policies in a
Mobile Environment

TEXT BOOKS:

1. Web Security, Privacy and Commerce Simson G Arfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia

1. Murthy

2. Bana

3. Bana

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5 H. Bakon

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AD-HOC & SENSOR NETWORKS (Professional Elective – V)
(CSE (AI & ML))

Prerequisites:

1. Computer Networks
2. Distributed Systems
3. Mobile Computing

Course Objectives:

- To understand the challenges of routing in ad-hoc and sensor networks
- To understand various broadcast, multicast and geo casting protocols in ad hoc and sensor networks
- To understand basics of Wireless sensors, and Lower Layer Issues and Upper Layer Issues of WSN

Course Outcomes:

- Understand the fundamental characteristics, applications, and design challenges of Mobile Ad-Hoc Networks (MANETs) and Wireless Sensor Networks (WSNs)
- Analyze and compare different routing protocols (Topology-based, Position-based, and Hybrid) for efficient data transmission in MANETs
- Evaluate broadcasting, multicasting, and geo-casting techniques to solve data transmission issues in ad-hoc environments
- Understand the architecture, physical layer, MAC layer, and routing protocols of Wireless Sensor Networks (WSN)
- Analyze the transport layer, application layer support, and performance issues of TCP in WSNs and MANETs

UNIT - I:

Introduction to Ad Hoc Networks

Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs

Criteria for classification, Taxonomy of MANET routing algorithms, Topology-based routing algorithms-Proactive: DSDV, WRP; Reactive: DSR, AODV, TORA; Hybrid: ZRP; Position- based routing algorithms-Location Services-DREAM, Quorum-based, GLS; Forwarding Strategies, Greedy Packet, Restricted Directional Flooding-DREAM, LAR; Other routing algorithms-QoS Routing, CEDAR.

UNIT - II:

Data Transmission

Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbour Knowledge-based: SBA, Multipoint

1. M. Ramesh

2. V. Ramesh

3. V. Ramesh

Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT - III:

Geo casting

Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.

TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - IV:

Basics of Wireless Sensors and Lower Layer Issues-Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V:

Upper Layer Issues of WSN

Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

TEXTBOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

REFERENCE BOOKS:

1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols.
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley.

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IV Year-II Semester

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SPEECH AND VIDEO PROCESSING (Professional Elective – VI)

Course Objectives:

- To make students understand speech and video processing techniques

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

- Describe the mechanisms of human speech production systems and methods for speech feature extraction.
- Understand basic algorithms of speech analysis and speech recognition.
- Explain basic techniques in digital video processing, including imaging characteristics and sensors.
- Apply motion estimation and object tracking algorithms on video

UNIT-I: Speech processing concepts

The speech production mechanism, Discrete time speech signals, Pole-Zero modeling of speech, relevant properties of the fast Fourier transform for speech recognition, convolution, linear and nonlinear filter banks, spectral estimation of speech using DFT. Linear Prediction analysis of speech.

UNIT-II:

Speech recognition Feature extraction for speech, static and dynamic feature for speech recognition, MFCC, LPCC, Distance measures, vector quantization models, Gaussian Mixture model, HMM

UNIT-III:

Multi-Dimensional Signals and Systems Multi-Dimensional Signals, Multi-Dimensional Transforms, Multi-Dimensional Systems, Multi-Dimensional Sampling Theory, Sampling Structure Conversion Digital Images and Video: Human Visual System and Color, Digital Video

UNIT-IV:

Motion Estimation Image Formation, Motion Models, 2D Apparent-Motion Estimation, Differential Methods, Matching Methods, Nonlinear Optimization Methods, Transform-Domain Methods, 3D Motion and Structure Estimation

UNIT-V:

Video Segmentation and Tracking Image Segmentation, Change Detection, Motion Segmentation, Motion Tracking, Image and Video Matting, Performance Evaluation. CNTFET..

Text Books:

1. Fundamentals of Speech recognition – L. Rabiner and B. Juang, Prentice Hall signal processing series

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2. Digital Video processing, A Murat Tekalp, 2nd edition, Prentice Hall.

Reference Books:

1. Discrete-time speech signal processing: principles and practice, Thomas F. Quatieri, Coth.
2. Video Processing and Communications, Yao Wang, J. Ostermann and Qin Zhang, Pearson Education
3. "Speech and Audio Signal Processing", B. Gold and N. Morgan, Wiley.
4. "Digital image sequence processing, Compression, and analysis", Todd R. Reed, CRC Press
5. "Handbook of Image and Video processing", Al Bovik, Academic press, second Edition

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B.Tech. CSE (AI & ML)

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IV Year – II Semester

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ROBOTIC PROCESS AUTOMATION (Professional Elective – VI)**Course Objectives:**

- Introduce robotic process automation, techniques of automation using UiPath RPA tool.

Course Outcomes:

- Understand the concepts of Robotic Process Automation.
- Apply the flow chart mechanism in various calculations.
- Applying UiPath tool for debugging process
- Design system managing techniques.
- Create application for process automation using UiPath tool.

UNIT - I:

Robotic Process Automation: Introduction, Scope and techniques of automation, Robotic process automation, Components of RPA, RPA platforms, About UiPath
UiPath Stack UiPath Studio, UiPath Robot, Types of Robots, UiPath Orchestrator
UiPath Studio Projects, User interface

The User Interface: Task recorder, Advanced UI interactions: Input methods, Output methods

UNIT - II:

Sequence, Flowchart, and Control Flow: Sequencing the workflow, Activities, Control Flow, various types of loops and decision making

Data Manipulation: Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, File operation with step-by-step example, CSV/Excel to data table and vice versa

UNIT - III:

Taking Control of the Controls: Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Handling events, revisit recorder, When to use OCR, Types of OCR available, How to use OCR

Plugins and Extensions: Terminal Plugin, SAP Automation, Citrix automation and Credential management

UNIT - IV:

Handling User Events and Assistant Bots: Assistant bots, Monitoring system event triggers, Monitoring image and element triggers, Launching an assistant bot on a keyboard event

Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging

1. Maarposh2. Vanna3. Vani

techniques, Collecting crash dumps, Error reporting

UNIT - V:

Managing and Maintaining the Code: Project organization, nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files

Deploying and Maintaining the Bot: Publishing using publish utility, using Orchestration Server to control bots, deploy bots, License Management, Publishing and Managing updates

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool – UiPath Kindle Edition

REFERENCE BOOKS:

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

1. Mueen Raza

2. V. Dha

3. V. Dha

4. Vasari

5. H. B. K. R.

6. R. Sindhu

7. Shrey

8. B. B. K. R.

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RANDOMIZED ALGORITHMS (Professional Elective – VI)

(CSE (AI & ML))

Course Objectives:

- To introduce the power of randomization in the design of algorithms.

Course Outcomes:

- Appreciate the fundamentals of randomized algorithm design.
- Understand the fundamentals of Markov chains and the Monte Carlo method.
- Apply high probability analysis to selected randomized algorithms.
- Understand the Fingerprint and Pattern Matching techniques
- Analyze and apply randomized algorithms to geometric problems

UNIT - I:

Introduction, A Min – Cut algorithm, Las Vegas and Monte Carlo, Binary Planar Partitions, A Probabilistic Recurrence

Game-Theoretic Techniques: Game Tree Evaluation, The Minimax Principle

UNIT - II:

Moments and Deviations: Occupancy Problems, The Markov and Chebyshev Inequalities, Randomized Selection, Two Point sampling, The Coupon Collector's problem.

Markov Chains and Random Walks: A 2-SAT example, Markov Chains, Random Walks on Graphs, Graph Connectivity

UNIT - III:

Algebraic Techniques: Fingerprinting and Freivald's Technique, Verifying Polynomial Identities, Perfect Matching in Graphs, Verifying Equality of Strings, A Comparison of Fingerprinting Techniques, Pattern Matching

UNIT - IV:

Data Structures: The Fundamental of Data-structures, Random Treaps, Skip Lists, Hash Tables Graph Algorithms: All Pairs Shortest Path, The Min- Cut Problem, Minimum Spanning Trees

UNIT - V:

Geometric Algorithms: Randomized Incremental Construction, Convex Hulls in the Plane, Duality, Half-Space Intersections, Dalaunay Triangulations, Trapezoidal Decompositions, Parallel and Distributed Algorithms: The PRAM Model, Sorting on a PRAM, Maximal Independent Sets, Perfect Matchings

1. Murthy

2. Vasa

3. Vasa

4. Vasa

TEXT BOOKS:

1. Randomized Algorithms: Rajeev Motwani, Prabhakar Raghavan, Cambridge University Press
2. Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and
3. Data Analysis by Eli Upfal and Michael Mitzenmacher.

1. Motwani

2. Upfal

3. Upfal

4. Vasani

5. H. Becker

6. R. Sindhur

7. Rey

8. B. B. Levensky

9. JD

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IV B.Tech – II Semester

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COGNITIVE COMPUTING (Professional Elective – VI)
(CSE (AI & ML))**Prerequisites:**

- Probability theory

Course Objectives:

- To provide an understanding of the central challenges in realizing aspects of human cognition.
- To provide a basic exposition to the goals and methods of human cognition.
- To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
- To support human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

Course Outcomes:

- Understand cognitive computing
- Plan and use the primary tools associated with cognitive computing.
- Plan and execute a project that leverages cognitive computing.
- Understand and develop the business implications of cognitive computing.
- Design and Implement cognitive applications utilizing DeepQA architecture and Unstructured Information Management Architecture (UIMA) to process complex data

UNIT - I:

Introduction to Cognitive Science: Understanding Cognition, IBM's Watson, Design for Human Cognition, Augmented Intelligence, Cognition Modeling Paradigms: Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

UNIT - II:

Cognitive Models of memory and language, computational models of episodic and semantic memory, modeling psycholinguistics.

UNIT - III:

Cognitive Modeling: modeling the interaction of language, memory and learning, Modeling select aspects of cognition classical models of rationality, symbolic reasoning and decision making.

UNIT - IV:

Formal models of inductive generalization, causality, categorization and similarity, the role of analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks.

1. Meera Ramesh

2. Vignan

3. Vignan

UNIT - V:

DeepQA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems.

TEXTBOOKS:

1. The Cambridge Handbook of Computational Psychology by Ron Sun (ed.), Cambridge University Press.

REFERENCE BOOKS:

1. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles Cognitive Computing and Big Data Analytics, Wiley
2. Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, Cognitive Computing: Theory and Applications: Volume 35 (Handbook of Statistics), North Hollan.

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CONVERSATIONAL AI (Professional Elective – VI)
(CSE (AI & ML))

Course Objectives:

- To be familiar with the basic knowledge about conversational systems.
- To understand the different techniques of natural language processing
- Study the fundamental role of machine learning in building conversational systems.
- To know the various applications of conversational systems and its future development

Course Outcomes:

- Understand the basic technologies required for building a conversational system.
- Learn the rule-based dialogue system
- Involve AI in building conversational system and build advanced systems that are cognitively inclined towards human behaviour.
- Develop a real time working conversational system for social domain that can intelligently process inputs and generate relevant replies.
- Develop, evaluate, and deploy end-to-end neural conversational models using modern datasets and retrieval-based techniques

UNIT - I:

Introducing Dialogue Systems

Introduction of Dialogue System, History of Dialogue Systems, Present-Day Dialogue Systems, Modeling Conversation Dialogue Systems, Designing and Developing Dialogue Systems

UNIT - II:

Rule-Based Dialogue Systems: Architecture, Methods, and Tools

Dialogue Systems Architecture, designing a Dialogue System, Tools for Developing Dialogue Systems, Rule-Based Techniques in Dialogue Systems Participating in the Alexa Prize

UNIT - III:

Statistical Data-Driven Dialogue Systems

Motivating the Statistical Data-Driven Approach, Dialogue Components in the Statistical Data-Driven Approach, Reinforcement Learning (RL), Representing Dialogue as a Markov Decision Process, From MDPs to POMDPs, Dialogue State Tracking, Dialogue Policy, Problems and Issues with Reinforcement Learning in POMDPs

UNIT - IV:

Evaluating Dialogue Systems

Process of Evaluation, Evaluating Task-Oriented Dialogue Systems, Evaluating Open-

1. Murugesu

2. Bharathi

3. Vignan

Domain Dialogue Systems, Evaluation Frameworks- PARADISE, Quality of Experience (QoE), Interaction Quality, Best Way to Evaluate Dialogue Systems

UNIT - V:

End-to-End Neural Dialogue Systems

Neural Network Approaches to Dialogue Modeling, A Neural Conversational Model, Introduction to the Technology of Neural Dialogue, Retrieval-Based Response Generation, Task-Oriented Neural Dialogue Systems, Open-Domain Neural Dialogue Systems, Some Issues and Current Solutions, Dialogue Systems: Datasets, Competitions, Tasks, and Challenges.

TEXT BOOKS:

1. Michael McTear, "Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots", Second Edition, Moran and Claypool Publishers, 2020.

REFERENCE BOOKS:

1. Cathy Pearl, "Designing Voice User Interfaces: Principles of Conversational Experiences", O'REILLY, 2016.

1. McTear

2. Vasari

3. Walters

4. Vasari 5. H. Baker 6. R. Sridhar 7. Ray

8. B. Baker 9. JD 10. Lange 11. Papa

12. Guy 13. Swarna 14. M. J. J.

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CHATBOTS (Open Elective – III)
(CSE (AI & ML))

Course Objectives:

- Knowledge on concepts of chatbots and understanding the developer environment bot framework.

Course Outcomes:

- Understand basic concepts of chatbots
- Analyze different entities in building bots
- Understand the concepts of advanced bot building
- Discuss different types of chatbot use cases
- Able to design, evaluate, and implement chatbot solutions that optimize business processes

UNIT - I:

Introduction to Chatbots: Definition of chatbots, Journey of Chatbots, Rise of Chatbots, Messaging Platforms.

UNIT - II:

Setting Up the Developer Environment Botframework

Local Installation, Installing NodeJS, Following the Development Pipeline, Storing Messages in Database

UNIT - III:

Basics of Bot Building- Intents, Entities

UNIT - IV:

Advanced Bot Building

Design Principles, Showing Product Results, Saving Messages, Building Your Own Intent Classifier

UNIT - V:

Business and Monetization Analytics, Chatbot Use Cases- Modes of Communication- Business-to-Business (B2B), Chap Business to-Consumer (B2C) Consumer-to-Consumer (C2C) Business-to-Employee (B2E), Employee-to-Employee (E2E), Chatbots by Industry Vertical

TEXT BOOKS:

1. Rashid Khan, Anik Das, Build Better Chatbots: A Complete Guide to Getting Started with Chatbots, Apress

1. Murugesu

2. Vaithya

3. Divya

REFERENCE BOOKS:

1. Drexen Braxley, Chat GPT #1 Bible - 10 Books in 1: A Comprehensive Guide to AI: Elevate Your Daily Life, Increase Work Output, Secure Financial Gains, Foster Career Growth, and Cultivate Modern Talents Paperback
2. D. Nardo Publications, ChatGPT Made Simple How Anyone Can Harness AI To Streamline Their Work, Study & Everyday Tasks To Boost Productivity & Maintain Competitive Edge By Mastering Prompt Engineering
3. Robert E. Miller, Prompt Engineering Bible Join and Master the AI Revolutions Profit Online with GPT-4 & Plugins for Effortless Money Making!
4. Lucas Foster, Chat GPT Bible Developer and Coder Special Edition: Enhancing Coding Productivity with AI-Assisted Conversations.

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EVOLUTIONARY COMPUTING (Open Elective – III)
(CSE (AI & ML))

Prerequisites:

1. Knowledge on algorithms

Course Objectives:

- Introduce the concepts of evolutionary computing and various evolution algorithms

Course Outcomes:

- Appraise the significance of evolutionary computing
- Apply genetic operators and genetic programming for classification problems
- Hybridization of genetic algorithms with other techniques
- Understand multi objective, interactive evolutionary algorithms.
- Analyze and solve multi-objective optimization problems using Pareto optimality, manage constraints, and understand interactive evolutionary techniques

UNIT - I:

Optimization, Modelling, and Simulation Problems Search Problems, Optimization Versus Constraint Satisfaction, The Famous NP Problems

Evolutionary Computing: The Origins: The Main Evolutionary Computing Metaphor, Brief History, The Inspiration from Biology, Evolutionary Computing

Evolutionary Algorithm: Definition, Components of Evolutionary Algorithms, An Evolutionary Cycle by Hand, Example Applications, The Operation of an Evolutionary Algorithm, Natural Versus Artificial Evolution, Evolutionary Computing, Global Optimization, and Other Search Algorithms

UNIT - II:

Representation, Mutation, and Recombination Representation and the Roles of Variation Operators, Binary Representation, Integer Representation, Real-Valued or Floating-Point Representation, Permutation Representation, Tree Representation

Fitness, Selection, and Population Management: Population Management Models, Parent Selection, Survivor Selection, Selection Pressure, Multimodal Problems, Selection, and the Need for Diversity

Popular Evolutionary Algorithm Variants: Genetic Algorithms, Evolution Strategies, Evolutionary Programming, Genetic Programming, Learning Classifier Systems, Differential Evolution, Particle Swarm Optimization, Estimation of Distribution Algorithms

1. *Murugesu*

2. *Vana*

3. *Adarsh*

UNIT - III:

Parameters and Parameter Tuning: Evolutionary Algorithm Parameters, EAs and EA Instances, Designing Evolutionary Algorithms, The Tuning Problem, Algorithm Quality: Performance and Robustness, Tuning Methods.

Parameter Control: Introduction, Examples of Changing Parameters, Classification of Control Techniques, Examples of Varying EA Parameters

UNIT - IV:

Working with Evolutionary Algorithms: Working of EA, Performance Measures, Test Problems for Experimental Comparisons, Example Applications

Hybridization with Other Techniques: Memetic Algorithms: Motivation for Hybridizing EAs, A Brief Introduction to Local Search, Structure of a Memetic Algorithm, Adaptive Memetic Algorithms, Design Issues for Memetic Algorithms, Example Application: Multistage Memetic Timetabling

UNIT - V:

Multi objective Evolutionary Algorithms Multiobjective Optimization Problems, Dominance and Pareto Optimality, EA Approaches to Multiobjective Optimization, Example Application: Distributed Coevolution of Job Shop Schedules

Constraint Handling: Two Main Types of Constraint Handling, Approaches to Handling Constraints, Example Application: Graph Three-Colouring

Interactive Evolutionary Algorithms: Characteristics of Interactive Evolution, Algorithmic Approaches to the Challenges of IEAs, Interactive Evolution as Design vs. Optimization, Example Application: Automatic Elicitation of User Preferences

TEXT BOOKS:

1. A. E. Eiben, J. E. Smith, Introduction to Evolutionary Computing, Second Edition, Springer.

REFERENCE BOOKS:

1. David E. Goldberg, "Genetic Algorithms in search, Optimization & Machine Learning".
2. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

1. Murkova

2. Vaher

3. White

4. Vasari

5. H. Becker

6. R. Sindhu

7. Gray

8. R. Bellman

JD

10. Jay

11. Rupa

12. Gray

13. Swaps

14. M. J. J.

Annexure-X

Approval of B.Tech Syllabus to other Departments for VR24

S.No.	Regulation	Year & Sem	Subject Name	Department
1	VR24	III-I	UI design- Flutter	CSE, IT
2	VR24	III-I	Machine Learning	IT
3	VR24	III-I	Machine Learning Lab	IT
4	VR24	III-II	Machine Learning	CSE, CSE(DS)
5	VR24	III-II	Artificial Intelligence	CSE
6	VR24	III-II	Machine Learning Lab	CSE, CSE(DS)
7	VR24	III-II	Artificial Intelligence Laboratory	CSE
8	VR24	IV-II	Artificial Intelligence (PE-V)	ECE
9	VR24	IV-II	Machine Learning (PE-V)	ECE

B.Tech.

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III Year - I Semester

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Skill Development Course (UI design- Flutter)
(Common to CSE,IT,CSE(AI & ML))**Course Objectives:**

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widgets and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

Course Outcomes:

- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

List of Experiments: Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.
b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
b) Implement navigation with named routes.
5. a) Learn about stateful and stateless widgets.
b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.
b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.
b) Implement form validation and error handling.
8. a) Add animations to UI elements using Flutter's animation framework.
b) Experiment with different types of animations (fade, slide, etc.).
9. a) Fetch data from a REST API.
b) Display the fetched data in a meaningful way in the UI.
10. a) Write unit tests for UI components.
b) Use Flutter's debugging tools to identify and fix issues.

Text Books:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

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8 B. Balakrishna

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B.Tech

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III Year - I Semester

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MACHINE LEARNING
(Common to IT, CSE(AI&ML))

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

Course Outcomes:

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy
- Demonstrate teamwork, documentation, and communication in ML-based projects

UNIT - I:

Learning–Types of Machine Learning – Supervised Learning – The Brain and the Neuron–
Design a Learning System–Perspectives and Issues in Machine Learning–Concept Learning
Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version
Spaces and the Candidate Elimination Algorithm–Linear Discriminants:–Perceptron–
Linear Separability – Linear Regression.

UNIT - II:

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error –
Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving
Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network
Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

UNIT - III:

Learning with Trees–Decision Trees–Constructing Decision Trees–Classification and
Regression Trees–Ensemble Learning–Boosting–Bagging–Different ways to Combine
Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods –
Unsupervised Learning – K means Algorithms

UNIT - IV:

Dimensionality Reduction – Linear Discriminant Analysis–Principal Component Analysis –
Factor Analysis–Independent Component Analysis–Locally Linear Embedding – Isomap –
Least Squares Optimization

Evolutionary Learning–Genetic algorithms–Genetic Offspring:–Genetic Operators–Using

1. *Mueen*

2. *Vishu*

3. *Vive*

Genetic Algorithms

UNIT - V:

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

Text Books:

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

Reference Books:

1. Tom M Mitchell, -Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, -Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, -Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
4. Ethem Alpaydin, -Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

1. Muhammad

2. Arha

3. Adi

4. Varun

5. K. Baten

6. R. Sindhu

7. Shrey

8. B. Balakrishna

9. DB

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11. Rupa

12. Am

13. Swarna

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B.Tech

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III Year - I Semester

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Machine Learning Lab
(Common to IT, CSE(AI&ML))

Course Objectives:

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes:

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance
- Demonstrate teamwork, documentation, and communication in ML projects

List of Experiments

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

Text Books:

1. Machine Learning – Tom M. Mitchell, - MGH.

Reference Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshall, Taylor & Francis.

1. Murphy

2. Wah

3. White

4. Vasari

5. K. Baker

6. R. Sindhu

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III Year - II Semester

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MACHINE LEARNING
(Common to CSE, CSE(DS))**Course Objectives:**

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

Course Outcomes:

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets
- Understand algorithms for non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy

UNIT - I:

Learning—Types of Machine Learning – Supervised Learning – The Brain and the Neuron—Design a Learning System—Perspectives and Issues in Machine Learning—Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm—Linear Discriminants:—Perceptron—Linear Separability – Linear Regression.

UNIT - II:

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

UNIT - III:

Learning with Trees—Decision Trees—Constructing Decision Trees—Classification and Regression Trees—Ensemble Learning—Boosting—Bagging—Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

UNIT - IV:

Dimensionality Reduction – Linear Discriminant Analysis—Principal Component Analysis – Factor Analysis—Independent Component Analysis—Locally Linear Embedding – Isomap – Least Squares Optimization

Evolutionary Learning—Genetic algorithms—Genetic Offspring:—Genetic Operators—Using Genetic Algorithms

1. Mue Rg

2. Vana

3. Vani

UNIT - V:

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

TEXT BOOKS:

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

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1. Tom M Mitchell, -Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, -Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, -Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
4. Ethem Alpaydin, -Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

1. Murphy

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10. Jorge

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13. Quang

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III Year - II Semester 3 0 0 3

ARTIFICIAL INTELLIGENCE
(CSE)

Prerequisites:

1. Programming for problem solving, Data Structures.

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning

Course Outcomes:

- Understand search strategies and intelligent agents
- Understand different adversarial search techniques
- Ability to understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- Apply propositional logic, predicate logic for knowledge representation
- Apply AI techniques to solve problems of game playing, and machine learning.

UNIT - I:

Introduction to AI, Intelligent Agents, problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

UNIT - II:

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT - III:

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using

1. Murthy

2. Vignan

3. Vignan

First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT - IV:

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT - V:

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

1. MueRone
2. Bama
3. Vani
4. Vani
5. H. Batten
6. R. Sindhu
7. Shrey
8. B. Balasubramanian
9. D. B.
10. Jayar
11. Rupa
12. S. S.
13. Swarna
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B.Tech. CSE (AI & ML)

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III Year - II Semester

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Machine Learning Lab
(Common to CSE, CSE(DS))

Course Objectives:

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes:

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance
- Demonstrate teamwork, documentation, and communication in ML projects

List of Experiments

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

Text Books:

1. Machine Learning – Tom M. Mitchell, - MGH.

Reference Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

1. Machine Learning

2. Python

3. Statistics

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III Year - II Semester

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ARTIFICIAL INTELLIGENCE LAB

(CSE)

Course Objectives:

- Become familiar with basic principles of AI toward problem solving, knowledge representation, and learning.

Course Outcomes:

- Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.

LIST OF EXPERIMENTS

Write a Program to Implement the following using Python.

1. Breadth First Search
2. Depth First Search
3. Tic-Tac-Toe game
4. 8-Puzzle problem
5. Water-Jug problem
6. Travelling Salesman Problem
7. Tower of Hanoi
8. Monkey Banana Problem
9. Alpha-Beta Pruning
10. 8-Queens Problem

TEXT BOOKS:

1. Artificial Intelligence a Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.

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B.Tech.**L T P C****IV Year - II Semester****3 0 0 3****ARTIFICIAL INTELLIGENCE (Professional Elective-V)**
(ECE)**Course Objectives:** The objectives of the course are to:

- To impart knowledge about Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems.
- To enable the students to understand the basic principles of Artificial Intelligence in various applications.

Course Outcomes: Upon completing this course, the students will be able to

- Understand the basics of the theory and about intelligent agents.
- Capable of using heuristic searches, aware of knowledge based systems and expert systems.
- Ability to understand applying the Prolog for AI experiments.
- Apply AI techniques to real-world problems to develop intelligent systems.
- Select appropriately from a range of techniques when implementing intelligent systems.

UNIT - I: Introduction

Introduction-Definition – foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation

UNIT - II: Problem Solving Methods

Problem solving Methods – Search Strategies- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing- Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT - III: Knowledge Representation

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining- Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering- Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information

UNIT - IV: Knowledge Acquisition

Introduction to Learning, Rule Induction, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning. Learning Using neural Networks, Probabilistic Learning Natural Language Processing.

1. Meer2. Varun3. Adarsh

UNIT - V: Expert systems

Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.

TEXT BOOKS:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education
2. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence: a logical approach", Oxford University Press.

REFERENCE BOOKS:

1. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
2. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

1. MueRao

2. Bhar

3. Chin

4. Vasari

5. K. Becker

6. R. Sindhura

7. Deep

8. B. Balakrishna

9. JD

10. Jay

11. Papa

12. Qant

13. Swarna

14. N. Jyoti

B.Tech.

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IV Year - II Semester

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MACHINE LEARNING (Professional Elective-V)
(ECE)**Course Objectives:**

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications
- Ability to understand and apply efficient algorithm for implementing the LLMs

UNIT - I:

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT - II:

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT - III:

Linear Models: Linear Basis Function Models -Maximum likelihood and least squares, Geometry of least squares, Sequential learning, Regularized least squares, Multiple outputs, The Bias-Variance Decomposition, Bayesian Linear Regression -Parameter distribution, Predictive, Equivalent, Bayesian Model Comparison, Probabilistic Generative Models-Continuous inputs, Maximum likelihood solution, Discrete features, Exponential family, Probabilistic Discriminative Models -Fixed basis functions, Logistic regression, Iterative reweighted least squares, Multiclass logistic regression, Probit regression, Canonical link functions.

UNIT - IV:

Kernel Methods: Constructing Kernels, Radial Basis Function Networks - Nadaraya-

1. *Meer*2. *Vanna*3. *Chir*

Watson model, Gaussian Processes -Linear regression revisited, Gaussian processes for regression, Learning the hyper parameters, Automatic relevance determination, Gaussian processes for classification, Laplace approximation, Connection to neural networks, Sparse Kernel Machines- Maximum Margin Classifiers, Overlapping class distributions, Relation to logistic regression, Multiclass SVMs, SVMs for regression, Computational learning theory, Relevance Vector Machines- RVM for regression, Analysis of sparsity, RVM for classification

UNIT - V:

Graphical Models: Bayesian Networks, Example: Polynomial regression, Generative models, Discrete variables, Linear-Gaussian models, Conditional Independence- Three example graphs, D-separation, Markov Random Fields -Conditional independence properties, Factorization properties, Illustration: Image de-noising, Relation to directed graphs, Inference in Graphical Models- Inference on a chain, Trees, Factor graphs, The sum-product algorithm, The max-sum algorithm, Exact inference in general graphs, Loopy belief propagation, Learning the graph structure.

TEXT BOOKS:

1. C. Bishop -Pattern Recognition and Machine Learning- -Springer, 2006.
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

Reference Books:

1. Nils J. Nilsson -Introduction to machine learning, Stanford University Stanford.
2. William J. Deuschle – Undergraduate Fundamentals of Machine Learning, thesis Harvard College, Cambridge.
3. Shai Shalev-Shwartz, Shai Ben-David- Understanding Machine Learning, From theory to Algorithms, Cambridge University press, 2014

1. Murphy 2. bishop 3. Shi 4. Vasari
5. K. Becker 6. R. Sudderth 7. T. Shap 8. B. Becker 1995
9. JD 10. Lay 11. Rupa 12. Eng
13. Frederick 14. N. W. H.