Centre for Internet of Things

List of courses focusing on employability/entrepreneurship/skill development

Name of the Course	Course Code	Name of the Programme (UG/ PG)	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Item No.	Page No.	Link to the relevant document
Python Programming	3230224	UG	Python is a versatile programming language that has gained immense popularity due to its readability, ease of use, and a vast ecosystem of libraries and frameworks. Proficiency in Python is highly beneficial for employability	15	35-37	Click Here
Data Structures	3230223	UG	A strong understanding of data structures is crucial for employability in various fields, particularly in the field of computer science and software development.	15	32-33	Click Here
IoT Embedded Systems Design	230402	UG	Utilize the PIC/ARM processor registers, instruction pipeline, interrupts and architecture	12	40-41	Click Here
Software Engineering	230403	UG	Choose the appropriate model for real life software project	12	42-44	Click Here
Artificial Intelligence & Machine Learning	230603	UG	Apply AI And ML Techniques to Solve Real World Problems	06	53-54	Click Here
Data Mining & Pattern Warehousing	230602	UG	Understanding data mining techniques and pattern warehousing is crucial for roles in data analysis and data science. Professionals in these roles use these skills to extract meaningful insights, identify patterns, and make data-driven decisions for their organizations.	06	51-52	Click Here
Intelligent Motor Control using Microcontrollers	910127	UG	Acquiring this skill enhances employability in industries like manufacturing and robotics. Mastering microcontroller-based motor control sets you apart, making a sought-after professional.	09	14	Click Here

Centre for Internet of Things

List of courses focusing on employability/entrepreneurship/skill development

Name of the Course	Course Code	Name of the Programme (UG/ PG)	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Item No.	Page No.	Link to the relevant document
Rural Electrification: Technologies & Economics	910128	UG	Enhance your employability by mastering the intricacies of electrification technologies and understanding the economic dynamics involved. Open doors to impactful career opportunities in the evolving landscape of rural development.	09	14	
Embedded System & IoT	230504	UG	With embedded systems and loT students will gain skill of various micro controllers used for loT boards.	09	179-180	
Data Sciences in loT	230502	UG	Analytics in loT will provide skills to the students by understanding exemplary models on ITEM IT - 09 06 various real time applications.	09	167-168	
Soft Computing Techniques	2305051	UG	As we know that, most of the companies use soft computing algorithm to build AI based projects. So here students can learn and apply subject knowledge of soft computing techniques to analyse real problems and apply that to solve the problems.	09	173-174	

Dated 338
07.03.2024

Minutes of Meeting

Board of Studies of Centre for Internet of Things

B.Tech Internet of Things (IoT)

01 December, 2023

Centre for Internert of Things

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA

माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत

A GOVT. AIDED UGC AUTONOMOUS INSTITUTE, AFFILIATED TO R.G.P.V. BHOPAL (M.P.), INDIA

NAAC ACCREDITED WITH A++ GRADE

Table of Contents

Date: 01-12-2023

Summary

(Approved by Academic Development Cell of the institute - BoS Meeting Scheduled on 01 December 2023)

Courses where revision was carried out*

(Course/subject name)	Course Code	Year/Date of Introduction	Year/Date of revision	Percentage of content added or replaced	Agenda Item No.	Page No.	Link of relevant documents/minutes
Nil							

Courses focusing on employability/entrepreneurship/ skill development*

	(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.	Link of relevant documents/minutes
1.	Python Programming	3230224	Python is a versatile programming language that has gained immense popularity due to its readability, ease of use, and a vast ecosystem of libraries and frameworks. Proficiency in Python is highly beneficial for employability across various fields.	16	3	Click Here
	Data Structures	3230223	A strong understanding of data structures is crucial for employability in various fields, particularly in the field of computer science and software development.	17	2-3	
	Iot Embedded Systems Design	230402	Utilize the PIC/ARM processor registers, instruction pipeline, interrupts and architecture	12	4-5	
	SoftwareEngineering	230403	Choose the appropriate model for real life software project	12	6-7	

Artificial Intelligence & Machine Learning	230603	Apply AI And ML Techniques to Solve Real World Problems	10	4	
Data Mining & Pattern Warehousing	230602	Understanding data mining techniques and pattern warehousing is crucial for roles in data analysis and data science. Professionals in these roles use these skills to extract meaningful insights, identify patterns, and make data-driven decisions for their organizations.	10	3	Click Here

New Courses added*

(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.	Link of relevant documents/minutes
Intelligent Motor Control using Microcontrollers	910127	Acquiring this skill enhances employability in industries like manufacturing and robotics. Mastering microcontroller-based motor control sets you apart, making a sought-after professional. Keep advancing your skills for a brighter future!	09		Click Here
Rural Electrification: Technologies & Economics	910128	Enhance your employability by mastering the intricacies of electrification technologies and understanding the economic dynamics involved. Open doors to impactful career opportunities in the evolving landscape of rural development.			

Feedback on curriculum received from stakeholders: Analysis& ATR*

Stakeholder	Student	Faculty	Alumni	Employer
No. Of Responses	II: 37 IV:34 VI: 25	13	--	--
Link of Analysis	Click Here	Click Here	--	--
ATR Link	Click Here	Click Here	--	--
Link showing Excel sheet of Google Form details of stakeholder	Click Here	Click Here	--	--

Minutes of Meeting Board of Studies

Board of Studies (BoS) meeting of the Centre for Internet of Things was held in hybrid mode on **December 1st, 2023** at **03:30 PM** onwards. The following external members were invited in addition to the faculty members of the department:

S.No.	Name of Expert	Designation and Organization
➢	Dr. Kaushlendra Sharma -1 ***(Vice-chancellor,Nominee)***	Assistant Professor, Department of Computer Science and Engineering, **IIIT-Nagpur**
➢	Mr. Mayank Soni, ***(Industry expert)***	**Custom Software, Engineer Senior Analyst**- Accenture Pune
➢	Dr. Rimjhim Agrawal, **(Alumus)**	Principal Data Scientist Utoipus Insights, Bangaluru RBD Icon, Unit 1, 3rd Floor, Doddanekundi-560037
➢	Dr. Anurag Singh, ***(Subject Expert)***	Associate Professor, **NIT-Delhi**
➢	Dr.Lokesh Chouhan,***(Subject Expert)***	Associate Professor, National Forensic Science University, Curti Podna, Goa

Above mentioned External experts and the following Internal members attended the meeting:

1. **Dr. Praveen Bansal,** AssistantProfessor & Coordinator, CoT
2. **Dr. Dhananjay Bisen,** Assistant Professor
3. **Dr. Aditya Dubey,**Assistant Professor
4. **Dr. Priyanka Garg**, Assistant Professor
5. **Dr. Yashwant Sawle**, Assistant Professor
6. **Dr. Nookala Venu**, Assistant Professor
7. **Dr. Saurabh Kumar Rajput**, Assistant Professor
8. **Dr. Bhavna Rathore**, Assistant Professor
9. **Dr. Kaushal Pratap Sengar**, Assistant Professor
10. **Dr. Murli Manohar,** Assistant Professor
11. **Dr. Gaurav Khare,** Assistant Professor

Agenda-wise Summary of BoS Meeting

Item CIoT1	To confirm the minutes of previous BoS meeting held in the month of May-June 2023 ➢ *The minutes of the last BoS held on 02nd June 2023 were confirmed. The BoS Minutes were presented & approved in Academic Council Meeting held on 14th December 2023*
Item CIoT2	The examination committees constituted vide Dean Academics Notice no 1332 dated 20/4/2021 need to be reconstituted this year. ➢ *Not Applicable*
Item CIoT3	To propose the scheme structure of VIII Semester with the provision of ONE DE & ONE OC course to be offered in online mode with credit transfer for the batch admitted in academic year 2020-21. (The total credits from I-VIII semester should not be less than 160 for this batch). ➢ *The scheme structure of B. Tech. VIII Semester of Internet of Things (IoT) for the batch admitted in 2020-21 is prepared and is annexed at **ANNEXURE-1***
Item CIoT4	To propose the list of courses which the students can opt from SWAYAM/NPTEL/ other MOOC Platforms/ Institution (MITS) MOOC, to be offered in online mode under Departmental Elective (DE) category courses (DE-5) and open category (OC3) for credit transfer in the VIII Semester under the flexible curriculum (Batch admitted in academic year 2020-21) ➢ *List of offered DE and OC courses in online is annexed at **ANNEXURE-2***

Details of Departmental Elective (DE-5): SWAYAM/NPTEL/MOOC

Code	Course Name	Offered By	Duration of the course	Start date	End date	Exam date	Name of the Mentor faculty
230861	Edge computing	IIT Patna	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr.Nookala Venu
230862	Cloud Computing and Distributed Systems	IITK	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr. Aditya Dubey
230863	Machine Learning for Engineering and science applications	IITM	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr.Dhananjay Bisen

Details of Departmental Open Category (OC-3): SWAYAM/NPTEL/MOOC

Code	Course Name	Offered By	Duration of the course	Start date	End date	Exam date	Name of the Mentor faculty
	Introduction To Internet Of Things	IITKGP	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Priyanka Garg

	Fuzzy Sets, Logic and Systems & Applications	IITK	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr.Gaurav
	Introduction To Soft Computing	IITKGP	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr.Nookala Venu
	Foundation of Cloud IoT Edge ML	IITP	8 Weeks	Feb 19, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Bhavna Rathore

Item CIoT5

To propose the list of "Additional Courses" which can be opted for getting an

(i) Honours (for students of the host department)

(ii) Minor Specialization (for students of other departments)

[These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. VIII semester students (for the batch admitted in 2020-21)] and for B.Tech. VI semester (for the batch admitted in 2021-22)]

(i) Following courses are identified & proposed for VIII Semester for their requirement towards getting Honors

S. No	Course Name	Offered By	Exam Date	Name of Mentor faculty
1.	Introduction to Machine Learning	IITM	Apr 21, 2024	Dr. Dhananjay Bisen
2.	An Introduction to Artificial Intelligence	IITD	Apr 20, 2024	Dr.Saurabh Rajput
3.	Artificial Intelligence: Knowledge Representation And Reasoning	IITM	Apr 27, 2024	Dr.Saurabh Rajput
4.	Deep Learning	IITKGP	Apr 28, 2024	Dr.Aditya Dubey
5.	Design and analysis of algorithms	CMI	Mar 24, 2024	Dr.Kaushal Pratap Sengar
6.	The Joy of Computing using Python	IIT Ropar	Apr 21, 2024	Dr. Saurabh Rajput
7.	Discrete Mathematics	IIT Ropar	Apr 28, 2024	Dr. Praveen Bansal
8.	Foundations of Cryptography	IIIT Bangalore	Apr 20, 2024	Dr.Praveen Bansal
9.	Embedded Systems Design	IITKGP	Apr 20, 2024	Dr.Praveen Bansal
10.	Microprocessors and Microcontrollers	IITKGP	Apr 21, 2024	Dr.Bhavna Rathore
11.	Programming, Data Structures And Algorithms Using Python	CMI	Mar 24, 2024	Dr.Gaurav

(ii) Following courses are identified & proposed for VI Semester for their requirement towards getting Honors

S. No	Tracks	Course Name	Offered By	Duration of Course	Start Date	End Date	Exam Date	Name of Mentor faculty
1	Artificial Intelligence and Machine Learning	Introduction to Machine Learning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
2		An Introduction to Artificial Intelligence	IITD	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Priyanka Garg
3		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
4		Artificial Intelligence: Knowledge Representation And Reasoning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 27, 2024	Dr.Aditya Dubey
5		Deep Learning	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Dr. Nookala Venu
1	Smart Computing & Algorithms	Design and analysis of algorithms	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
2		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
3		The Joy of Computing using Python	IIT Ropar	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Saurabh Rajput
4		Discrete Mathematics	IIT Ropar	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Dr. Praveen Bansal
50		Foundations of Cryptography	IIIT Bangalore	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Gaurav
1	Robotics	Embedded Systems Design	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Praveen Bansal
2		Sensors and Actuators	IISc	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 27, 2024	Dr.Bhavna Rathore
3		Microprocessors and Microcontrollers	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Bhavna Rathore
4		Introduction to Machine Learning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
5		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal

(ii) Following courses are identified & proposed for VI Semester for their requirement towards getting Honors

S. No	Tracks	Course Name	Offered By	Duration of Course	Start Date	End Date	Exam Date	Name of Mentor faculty
1	Artificial Intelligence and Machine Learning	Introduction to Machine Learning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
2		An Introduction to Artificial Intelligence	IITD	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Priyanka Garg
3		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
4		Artificial Intelligence: Knowledge Representation And Reasoning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 27, 2024	Dr.Aditya Dubey
5		Deep Learning	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Dr. Nookala Venu
1	Smart Computing & Algorithms	Design and analysis of algorithms	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
2		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
3		The Joy of Computing using Python	IIT Ropar	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Saurabh Rajput
4		Discrete Mathematics	IIT Ropar	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Dr. Praveen Bansal
50		Foundations of Cryptography	IIIT Bangalore	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Gaurav
1	Robotics	Embedded Systems Design	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Praveen Bansal
2		Sensors and Actuators	IISc	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 27, 2024	Dr.Bhavna Rathore
3		Microprocessors and Microcontrollers	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Bhavna Rathore
4		Introduction to Machine Learning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
5		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal

(ii) Following courses are identified & proposed for VI Semester for their requirement towards getting Honors

S. No	Tracks	Course Name	Offered By	Duration of Course	Start Date	End Date	Exam Date	Name of Mentor faculty
1	Artificial Intelligence and Machine Learning	Introduction to Machine Learning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
2		An Introduction to Artificial Intelligence	IITD	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Priyanka Garg
3		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
4		Artificial Intelligence: Knowledge Representation And Reasoning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 27, 2024	Dr.Aditya Dubey
5		Deep Learning	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Dr. Nookala Venu
1	Smart Computing & Algorithms	Design and analysis of algorithms	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
2		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
3		The Joy of Computing using Python	IIT Ropar	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Saurabh Rajput
4		Discrete Mathematics	IIT Ropar	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Dr. Praveen Bansal
50		Foundations of Cryptography	IIIT Bangalore	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Gaurav
1	Robotics	Embedded Systems Design	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Praveen Bansal
2		Sensors and Actuators	IISc	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 27, 2024	Dr.Bhavna Rathore
3		Microprocessors and Microcontrollers	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Bhavna Rathore
4		Introduction to Machine Learning	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
5		Programming, Data Structures And Algorithms Using Python	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal

ii) Minor Specialization (for students of other departments)

Following courses are identified & proposed for their requirement towards getting Minor Speciation in Internet of Things(IoT):

Domain	Course Name	Offered By	Duration of course	Start date	End date	Exam date	Name of Mentor Faculty
Internet of Things	Introduction To Internet Of Things	IITKGP	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Bhavna Rathore
	Introduction To Industry 4.0 And Industrial Internet Of Things	IITKGP	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Praveen Bansal
	An Introduction to Artificial Intelligence	IITD	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr.Saurabh Rajput
	Introduction to Machine Learning	IITM	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
	Introduction To Soft Computing	IITKGP	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr. Nookala Venu

- *The Details is also annexed as **ANNEXURE-3***

Item CIoT6

To review and finalize the scheme structure of B.Tech VI Semester under the flexible curriculum (Batch admitted in 2021-22)

- *The Scheme structure of VI semester of the B.Tech Internet of Things(IoT) of 2021-22 admitted batche under the flexible curriculum is at **ANNEXURE -4***

Item CIoT7

To review & finalize the syllabi for all Departmental Core Courses (DC) and Mandatory Course (MC) of B. Tech VI Semester (for batch admitted in 2021-22) under the flexible curriculum along with their COs.

- *The Syllabi along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT)students of 2020-21 admitted batch under the flexible curriculum is included at **ANNEXURE-5***

Item CIoT8

To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered (for batches admitted in 2021-22) in online mode under Departmental Elective (DE-1) Course with credit transfer, in the VI Semester.

Details of Departmental Elective (DE-1): SWAYAM/NPTEL/MOOC

Code	Course Name	Offered By	Duration of the course	Start date	End date	Exam date	Name of the Mentor faculty
230664	Introduction To Industry 4.0 And Industrial Internet Of Things	IITM	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr.Kaushal Pratap Sengar
230665	Foundation of Cloud IoT Edge ML	IITP	8 Weeks	Feb 19, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Bhavna Rathore
230666	Edge Computing	IIT Patna	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr.Nookala Venu

- *The details are attached as **ANNEXURE-6***

Item CIoT9

To review and finalize the courses & syllabi to be offered (for batch admitted in 2021-22) under the Open Category (OC) Courses (in traditional mode) for VI semester students of other departments along with their COs.

- **Following is the list of OC courses proposed for the VI Semester (Batch admitted in 2021-22), for students of other branches**

Category	Course Name	Course code
Open Category (OC1)	Intelligent Motor Control using Microcontrollers	910127
	Rural Electrification: Technologies &Economics	910128

- *The syllabi along with Course Outcomes (COs) are included in **ANNEXURE -7***

Item CIoT10

To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses to be offered in B.Tech.VI semester (for batch admitted in 2021-22).

- *The Experiment list/ Lab manual for various laboratory courses to be offered in along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT) students of 2021-22 admitted batch under the flexible curriculum is included at **ANNEXURE-8***

Item CIoT11

To review and finalize the suggestive list of projects which can be offered under the 'Skill based mini-project' category in various laboratory components based courses to be offered in B.Tech. VI Semester (for the batch admitted in 2021-22).

- *The list of skilled based mini projects for various laboratory courses to be offered in along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT) students of 2021-22*

Item CIoT8

To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered (for batches admitted in 2021-22) in online mode under Departmental Elective (DE-1) Course with credit transfer, in the VI Semester.

Details of Departmental Elective (DE-1): SWAYAM/NPTEL/MOOC

Code	Course Name	Offered By	Duration of the course	Start date	End date	Exam date	Name of the Mentor faculty
230664	Introduction To Industry 4.0 And Industrial Internet Of Things	IITM	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr.Kaushal Pratap Sengar
230665	Foundation of Cloud IoT Edge ML	IITP	8 Weeks	Feb 19, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Bhavna Rathore
230666	Edge Computing	IIT Patna	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr.Nookala Venu

- *The details are attached as **ANNEXURE-6***

Item CIoT9

To review and finalize the courses & syllabi to be offered (for batch admitted in 2021-22) under the Open Category (OC) Courses (in traditional mode) for VI semester students of other departments along with their COs.

- **Following is the list of OC courses proposed for the VI Semester (Batch admitted in 2021-22), for students of other branches**

Category	Course Name	Course code
Open Category (OC1)	Intelligent Motor Control using Microcontrollers	910127
	Rural Electrification: Technologies &Economics	910128

- *The syllabi along with Course Outcomes (COs) are included in **ANNEXURE -7***

Item CIoT10

To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses to be offered in B.Tech.VI semester (for batch admitted in 2021-22).

- *The Experiment list/ Lab manual for various laboratory courses to be offered in along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT) students of 2021-22 admitted batch under the flexible curriculum is included at **ANNEXURE-8***

Item CIoT11

To review and finalize the suggestive list of projects which can be offered under the 'Skill based mini-project' category in various laboratory components based courses to be offered in B.Tech. VI Semester (for the batch admitted in 2021-22).

- *The list of skilled based mini projects for various laboratory courses to be offered in along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT) students of 2021-22*

	admitted batch under the flexible curriculum is included at ***ANNEXURE-9***
Item CIoT12	**To review and finalize the scheme and syllabi of B. Tech. IV Semester (for batch admitted in 2022-23) under the flexible curriculum along with their COs.** ➢ *The scheme and Syllabi along with the Course Outcomes of IV semester of the B.Tech Internet of Things(IoT)students of 2022-22 admitted batch under the flexible curriculum is included at* ***ANNEXURE-10***
Item CIoT13	**To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses to be offered in Batch IV semester (for batch admitted in 2022-23)** ➢ *The Experiment list/ Lab manual for various laboratory courses to be offered in along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT) students of 2022-23 admitted batch under the flexible curriculum is included at* ***ANNEXURE-11***
Item CIoT14	**To review and finalize the suggestive list of projects which can be offered under the 'Skill based mini-project' category in various laboratory components based courses to be offered in B. Tech IV Semester** ***(for the batch admitted in 2022-23)*** ➢ *The list of skilled based mini projects for various laboratory courses to be offered in along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT) students of 2022-23 admitted batch under the flexible curriculum is included at* ***ANNEXURE-12***
Item CIoT15	**To review and finalize the scheme and syllabi of B. Tech. II Semester (for batch admitted in 2023-24) under the flexible curriculum along with their Cos** ➢ *The scheme and Syllabi along with the Course Outcomes of II semester of the B.Tech Internet of Things(IoT) students of 2023-24 admitted batch under the flexible curriculum is included at* ***ANNEXURE-13***
Item CIoT16	**To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses to be offered in Batch II semester (for batch admitted in 2023-24)** ➢ *The Experiment list/ Lab manual for various laboratory courses to be offered in along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT) students of 2023-24 admitted batch under the flexible curriculum is included at* ***ANNEXURE-14***
Item CIoT17	**To review and finalize the suggestive list of projects which can be offered under the 'Skill based mini-project' category in various laboratory components based courses to be offered in B. Tech IV Semester** ***(for the batch admitted in 2023-24)*** ➢ *The list of skilled based mini projects for various laboratory courses to be offered in along with the Course Outcomes of VI semester of the B.Tech Internet of Things(IoT) students of 2023-24*

	admitted batch under the flexible curriculum is included at ***ANNEXURE-15***
Item CIoT18	**To review the CO attainments, identify gaps and suggest corrective measures for the improvement in the CO attainment levels for the courses taught in Jan-June 2023 Session.** ➢ *The CO attainments for each course was computed by the respective faculty are compiled for the November. The gap in attainment, if any, was identified and the corrective actions to be taken were proposed by the subject faculty is reviewed. The CO attainment level of the subject in the above duration is annexed at* ***ANNEXURE -16***
Item CIoT19	**To review the PO attainment, CO-PO mapping matrix and action to be taken to improve PO attainment level.** ➢ *The data is attached as* ***ANNEXURE-17***
Item CIoT20	**To review curricula feedback from various stakeholders, its analysis and impact.** ➢ *The Feedback on the curriculum is taken from the Stakeholder (Students, Faculty, Alumni, and Employer) in online mode using Moodle &Google Forms. The analysis is carried out ona scale of 1-5. Few suggestions were received from the alumni & employer. Some of them are already in place. The feedback analysis is annexed at* ***ANNEXURE -18***
Item CIoT21	**To discuss and recommend the scheme structure & syllabi of PG Programme (M.E./M.Tech./MCA/MBA) along with their Course Outcomes (COs)** ➢ *Not Applicable*
Item CIoT22	**To recommend the scheme structure and Syllabus of Ph.D. Course Work (specific to Doctoral Research Scholars, if any)** ➢ *Not Applicable*
Item CIoT23	**Any other matter.** ➢ *The BoS members has discussed the proposed Program Educational Objectives(PEOS) and Program Specific Objectives (PSOs) of Centre for IoT*

Suggestion by Expert Members:

1. Project list should change/ update every semester
2. Use of simulation based tools to get real touch of hardware
3. Include BLDC motor in the syllabus of Embedded Control of Electrical Motors (ECEM).
4. There could be a provision of additional credits for the students who get external certifications for example Google / Microsoft /AWS cloud certification

5. In Skilled Based mini project : Students tend to overlook how their work fits into a larger project. To address this, groups of students can collaborate on a comprehensive project, showcasing real-life solutions during placements, such as a library management system.

The meetings ended with the vote of thanks by BoS Coordinator.

Dr. Gaurav Khare

Dr. Murli Manohar

Dr. Kaushal Pratap Sengar

Dr. Bhavna Rathore

Dr. Saurabh Kumar Rajput

Dr.Yashwant Sawle

Dr. Nookala Venu

Dr. Priyanka Garg

Dr. Aditya Dubey

Dr. Dhananjay Bisen

Present

Dr. Kaushlendra Sharma -1
Assistant Professor, Department of Computer Science and Engineering, IIIT-Nagpur

Present-

Dr. Anurag Singh
Department of CSE
Associate Professor, NIT-Delhi

Present

Dr.Lokesh Chouhan
Associate Professor, National Forensic Science University, Curti Podna, Goa

Present

Mr. Mayank Soni
Custom Software, Engineer
Senior Analyst- Accenture Pune

Present

Dr. Rimjhim Agrawal
Principal Data Scientist Utoipus Insights, Bangaluru

Dr. Praveen Bansal
Assistant Professor
Coordinator, Centre for Internet of Things

Coordinator
Centre for Internet of Things
MITS, Gwalior

28/2/2024.
DEAN (ACADEMICS)
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Centre for Internet of Things

Scheme of Evaluation

B.Tech. II Semester-Internet of Things(IoT)

(for batch admitted in academic session 2023-24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam	Duration of Exam
				Theory Slot				Practical Slot				L	T	P				
				End Term Evaluation		Continuous Evaluation		End Sem. Exam	Continuous Evaluation									
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	3230221	DC	Operating System	50	10	20	20	-	-	-	100	3	1	-	4	Blended	PP	2 Hrs
2.	3230222	DC	Sensor Technology	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
3.	3230223	DC	Data Structures	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
4.	3230224	DC	Python Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
5.	3250106	BSC	Probability & Random Process	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP	2 Hrs
Total				**250**	**50**	**100**	**100**	**120**	**90**	**90**	**800**	**11**	**5**	**6**	**19**	**-**	**-**	**-**
6.	3000002	**Natural Sciences & Skills**	Engineering Chemistry	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
Summer Internship Project – I (Institute Level) (Qualifier): Minimum two-week duration: Evaluation in III Semester.																		

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences& Skills: Engineering Physics / Engineering Chemistry / Environmental Science/ Language

Credits of Natural Sciences & Skills will be added in the VI Semester.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
-	-	16	03	16	03	–	–	19
-	-	84.21 %	15.78 %	84.21 %	15.78 %			Credits %

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Scheme of Evaluation

(for batch admitted in academic session 2022-23)

B. Tech. Internet of Things (IoT)- IV Semester

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Paper
				Theory Slot				Practical Slot				L	T	P				
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation									
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2230421	DC	Computer Architecture and Microprocessor	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2Hrs
2.	2230422	DC	IoT Embedded Systems Design	50	10	20	20	60	20	20	200	3	-	2	4	Blended	PP	2Hrs
3.	2230423	DC	Software Engineering	50	10	20	20	60	20	20	200	3	-	2	4	Blended	PP	2Hrs
4.	2230424	DC	IoT Architecture and Protocols	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP	2Hrs
5.	2230425	DC	Network & Web Security	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP	2Hrs
6.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO	-
Total				**250**	**50**	**100**	**100**	**230**	**60**	**60**	**850**	**14**	**01**	**08**	**19**	-	-	
7.	3000004	Natural Sciences & Skills	Language	50	10	20	20	30	10	10	150	1	-	2	Grade	Blended	MCQ	1.5 Hrs
	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ	1.5Hrs

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	02	15	03	01	15	-	03	01	-	19
-	--	78.94%	15.78%	5.3%	78.94%	-	33.3%	5.3%	-	Credits %

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Centre for Internet of Things

Scheme of Evaluation

(for batch admitted in academic session 2021-22)

B. Tech. Internet of Things (IoT) - VI-Semester

S.No	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	^{SS}Mode of Exam.	Duration of Exam
				Theory Slot				Practical Slot			MOOCs									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P				
				End Sem. Exam.	$^{\$}$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project										
1.	230601	DC	Compiler Design	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	PP	2Hrs
2.	230602	DC	Data Mining & Pattern Warehousing	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	PP	2Hrs
3.	230664 230665 230666	DE	Departmental Elective* (DE-1)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ	2Hrs
4.		OC	Open Category (OC-1)**	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP	2Hrs
5.	230603	MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	PP	2Hrs
6.	230604	DLC	Minor Project-II	-	-	-	-	60	40	-	-	-	100	-	-	4	2	Offline	SO	
7.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	1	Interactive	SO	
Total				**200**	**40**	**80**	**80**	**290**	**100**	**60**	**25**	**75**	**950**	**15**	-	**12**	**21**	-	-	
8.	1000007	MAC	Intellectual Property Rights (IPR)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	**MCQ**	
Summer Internship-III (On Job Training) for Four weeks duration: Evaluation in VII Semester																				
Additional Course for Honors or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honors or Minor specialization**																

$^{\$}$**proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

^{SS}**MCQ:** Multiple Choice Question ^{SS}**AO:** Assignment + Oral ^{SS}**PP:** Pen Paper ^{SS}**SO:** Submission + Oral

***Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform with credit transfer, ** Course run in traditional mode**

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
00	03	12	05	01	11	00	07	02	01	21
00%	14.29%	57.14%	23.81%	4.76%	52.4%	00%	33.3%	9.5%	4.8%	Credits %

29/4/2022
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Centre for Internet of Things

Scheme of Evaluation

(for batch admitted in academic session 2021-22)

B. Tech. Internet of Things (IoT) - VI-Semester

S.No	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	$^{\$\$}$Mode of Exam.	Duration of Exam
				Theory Slot				Practical Slot			MOOCs									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P				
				End Sem. Exam.	$^{\$}$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project										
1.	230601	DC	Compiler Design	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	PP	2Hrs
2.	230602	DC	Data Mining & Pattern Warehousing	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	PP	2Hrs
3.	230664 230665 230666	DE	Departmental Elective* (DE-1)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ	2Hrs
4.		OC	Open Category (OC-1)**	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP	2Hrs
5.	230603	MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	PP	2Hrs
6.	230604	DLC	Minor Project-II	-	-	-	-	60	40	-	-	-	100	-	-	4	2	Offline	SO	
7.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	1	Interactive	SO	
	Total			200	40	80	80	290	100	60	25	75	950	15	-	12	21	-	-	
8.	1000007	MAC	Intellectual Property Rights (IPR)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	MCQ	
				Summer Internship-III (On Job Training) for Four weeks duration: Evaluation in VII Semester																
Additional Course for Honors or minor Specialization				Permitted to opt for maximum two additional courses for the award of Honors or Minor specialization																

$^{\$}$**proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

$^{\$\$}$MCQ: Multiple Choice Question $^{\$\$}$AO: Assignment + Oral $^{\$\$}$PP: Pen Paper $^{\$\$}$SO: Submission + Oral

***Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform with credit transfer, ** Course run in traditional mode**

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
00	03	12	05	01	11	00	07	02	01	21
00%	14.29%	57.14%	23.81%	4.76%	52.4%	00%	33.3%	9.5%	4.8%	Credits %

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*DE-1 (SWAYAM/NPTEL/ MOOC platform)		**Open Category (OC-1)(For students of other branches)	
230664	Introduction To Industry 4.0 And Industrial Internet Of Things	910xxx	Intelligent Motor Control using Microcontrollers
230665	Foundation of Cloud IoT Edge ML	910xxx	Rural Electrification: Technologies & Economics
230666	Edge Computing		

(i) Following courses are identified & proposed for VI Semester for their requirement towards getting Honors

Tracks for Honor Specialization

Internet of Things (IoT)

S. No	Tracks	Course Name	Course Code	Offered By	Duration of Course	Start Date	End Date	Exam Date	Name of Mentor faculty
1	Artificial Intelligence and Machine Learning	Introduction to Machine Learning	H230601	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
2		An Introduction to Artificial Intelligence	H230602	IITD	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Priyanka Garg
3		Programming, Data Structures And Algorithms Using Python	H230603	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
4		Artificial Intelligence: Knowledge Representation And Reasoning	H230604	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 27, 2024	Dr.Aditya Dubey
5		Deep Learning	H230605	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Dr. Nookala Venu
1	Smart Computing & Algorithms	Design and analysis of algorithms	H230606	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
2		Programming, Data Structures And Algorithms Using Python	H230607	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar
3		The Joy of Computing using Python	H230608	IIT Ropar	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Saurabh Rajput
4		Discrete Mathematics	H230609	IIT Ropar	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Dr. Praveen Bansal

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50		Foundations of Cryptography	H230610	IIIT Bangalore	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Gaurav
1	Robotics	Embedded Systems Design	H230611	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr. Praveen Bansal
2		Sensors and Actuators	H230612	IISc	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 27, 2024	Dr.Bhavna Rathore
3		Microprocessors and Microcontrollers	H230613	IITKGP	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Bhavna Rathore
4		Introduction to Machine Learning	H230614	IITM	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
5		Programming, Data Structures And Algorithms Using Python	H230615	CMI	8 weeks	Jan 22, 2024	Mar 15, 2024	Mar 24, 2024	Dr. Kaushal Sengar

ii) ***Minor Specialization (for students of other departments)***

Following courses are identified & proposed for their requirement towards getting Minor Speciation in Internet of Things(IoT):

Domain	Course Name	Offered By	Duration of course	Start date	End date	Exam date	Name of Mentor Faculty
Internet of Things	Introduction To Internet Of Things	IITKGP	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Bhavna Rathore
	Introduction To Industry 4.0 And Industrial Internet Of Things	IITKGP	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Praveen Bansal
	An Introduction to Artificial Intelligence	IITD	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr.Saurabh Rajput
	Introduction to Machine Learning	IITM	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
	Introduction To Soft Computing	IITKGP	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr. Nookala Venu

Note: *Credit for opting a particular NPTEL course will be given only once throughout the tenure of B.Tech. program*

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DEAN (ACADEMICS) 03/12/24

Scheme of Evaluation *(for batch admitted in academic session 2020-21)*

B. Tech. VIII Semester: Internet of Things (IoT)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs			L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam							
				End Sem. Exam	Proficiency in subject	Mid Sem. Exam	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	230861 230862 230863	DE	Departmental Elective* (DE-5)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ
2.	910**	OC	Open Category* (OC-3)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ
3.	230821	DLC	Internship/Research Project/ Innovation & Start-up	-	-	-	-	250	150	-	-	-	400	-	-	18	9	Offline	SO
4.	230822	-	Professional Development sheet	-	-	-	-	50	-	-	-	-	50	-	-	4	2	Interactive	SO
	Total			--	---	-	-	300	150		50	150	650	6	-	22	17		
	Additional Course for Honours or minor Specialization			Permitted to opt for maximum two additional courses for the award of Honors or Minor specialization															

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

*All of these courses will run through SWAYAM/NPTEL/ MOOC with credit transfer

$ Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department)

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	PD	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	06	09	02	-	-	06	09	02	17
-	-	35.29%	52.95%	11.76%	-	-	35.29%	52.95%	11.76%	Credits %

*DE-5 (SWAYAM/NPTEL/ MOOC platform)		*Open Category (OC-3) (SWAYAM/NPTEL/ MOOC platform) (For students of other branches)	
230861	Edge computing	910xxx	Introduction To Internet Of Things
230862	Cloud Computing and Distributed Systems	910xxx	Fuzzy Sets, Logic and Systems & Applications
230863	Machine Learning for Engineering and science applications	910xxx	Introduction To Soft Computing

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(i) Following courses are identified & proposed for VIII Semester for their requirement towards getting Honors

S.No	Course Name	Offered By	Exam Date	Name of Mentor faculty
1.	Introduction to Machine Learning	IITM	Apr 21, 2024	Dr. Dhananjay Bisen
2.	An Introduction to Artificial Intelligence	IITD	Apr 20, 2024	Dr.Saurabh Rajput
3.	Artificial Intelligence: Knowledge Representation And Reasoning	IITM	Apr 27, 2024	Dr.Saurabh Rajput
4.	Deep Learning	IITKGP	Apr 28, 2024	Dr.Aditya Dubey
5.	Design and analysis of algorithms	CMI	Mar 24, 2024	Dr.Kaushal Pratap Sengar
6.	The Joy of Computing using Python	IIT Ropar	Apr 21, 2024	Dr. Saurabh Rajput
7.	Discrete Mathematics	IIT Ropar	Apr 28, 2024	Dr. Praveen Bansal
8.	Foundations of Cryptography	IIIT Bangalore	Apr 20, 2024	Dr.Praveen Bansal
9.	Embedded Systems Design	IITKGP	Apr 20, 2024	Dr.Praveen Bansal
10.	Microprocessors and Microcontrollers	IITKGP	Apr 21, 2024	Dr.Bhavna Rathore
11.	Programming, Data Structures And Algorithms Using Python	CMI	Mar 24, 2024	Dr.Gaurav

ii) Minor Specialization (for students of other departments)

Following courses are identified & proposed for their requirement towards getting Minor Speciation in Internet of Things(IoT):

Domain	Course Name	Offered By	Duration of course	Start date	End date	Exam date	Name of Mentor Faculty
Internet of Things	Introduction To Internet Of Things	IITKGP	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Bhavna Rathore
	Introduction To Industry 4.0 And Industrial Internet Of Things	IITKGP	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr.Praveen Bansal
	An Introduction to Artificial Intelligence	IITD	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 20, 2024	Dr.Saurabh Rajput
	Introduction to Machine Learning	IITM	12 Weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Dr. Dhananjay Bisen
	Introduction To Soft Computing	IITKGP	8 Weeks	Jan 22, 2024	Mar 15, 2024	Mar 23, 2024	Dr. Nookala Venu

II semester

Syllabus

2023-2024

B.Tech.

in

Internet of Things(IoT)

Madhav Institute of Technology & Science
Gwalior-474005

Centre for Internet of Things

Operating System: 3230221

COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

Unit I

Basics of Operating System: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Unit II

Process Management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

Unit III

Process Synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Unit IV

Memory Management: Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit V

Storage Management: Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

RECOMMENDED BOOKS

- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

1. **Describe** the basic concept of operating systems.
2. **Analyze** the working of operating system.
3. **Examine** the working of various scheduling/allocation approaches.
4. **Measure** the performance of various scheduling/allocation approaches.
5. **Analyze** the various operating system problems/issues.

Centre for Internet of Things

Sensor Technology: 3230222

Course Objective. Introduction to various types of sensors and the design of basic circuit building blocks.

Unit I. Sensors Fundamentals and Characteristics: Sensor, actuator and transducer. Signals and Systems; Sensor Classification: passive and active Sensor, absolute and relative Sensor; Units of Measurements; Sensor Characteristics: Transfer Function, Calibration, Nonlinearity, Saturation Repeatability, Dead Band ,Resolution.

Unit II. Principle of Sensing & Transduction: Mechanical and Electromechanical sensor, Resistive (potentiometric type), Strain gauge, Inductive sensor: common types- Reluctance change type, LVDT, Capacitive Sensors, Thermal Sensors, Magnetic Sensors, Proximity Sensor, Piezoelectric Effect.

Unit III. Interface Electronic Circuits: Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors.

Unit IV. Smart Sensor Technologies: Architecture of Smart Sensor: Features, Fabrication of Sensor And Smart Sensor, Integration of Micromachining and Microelectronics,Wafer bonding, LIGA process, Standard of Smart Sensor Network, Communication for smart sensors.

Unit V. Sensors in Different Application Area: Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors Neuro sensors, Biosensors, MEMS Sensors, Sensors for Mechanical Shock, Machinery Vibration Monitoring Sensors, Humidity Sensors, Electromagnetism in Sensing.

Recommended Books:

1. John S.Wilson "Sensor Technology" 4TH edition,Elsevier.2005
2. Jacob Fraden "Sensor Technology Design & Application"4thedition ,Springer .2010
3. Frank "Understanding Smart Sensors"2nd Ed.2002.
4. Ramon P. A. and Webster J. G., "Sensors and Signal Conditioning" 2nd 2001 Ed., John Wiley and Sons.
5. Feng Z. and Leonidas G., "Wireless Sensor Networks", Elsevier Eastern Limited. 2007
6. Barney G., "Intelligent Instrumentation", Prentice-Hall International Editions
7. Yamasaki H., "Intelligent Sensors", Elsevier Eastern Limited. 1996

Course Outcomes:

After completing this course, the student will be able to:

1. **Assess** sensor classifications and characteristics based on signals and systems
2. **Analyze** sensing principles of different sensors
3. **Design** interface circuits using conversion techniques
4. **Synthesize** the architecture and fabrication of smart sensors
5. **Evaluate** applicability of sensors for real world industrial applications

Centre for Internet of Things

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Unit V. Sensors in Different Application Area: Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors Neuro sensors, Biosensors, MEMS Sensors, Sensors for Mechanical Shock, Machinery Vibration Monitoring Sensors, Humidity Sensors, Electromagnetism in Sensing.

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1. John S.Wilson "Sensor Technology" 4TH edition,Elsevier.2005
2. Jacob Fraden "Sensor Technology Design & Application"4thedition ,Springer .2010
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Centre for Internet of Things

Data Structure: 3230223

COURSE OBJECTIVES

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

Unit-I

Introduction to Data Structures: Algorithms & their characteristics, asymptotic notations. arrays and its representations, index to address translation. Link list: Introduction, implementation of linked list, operations, circular link list, doubly linked list, polynomial manipulation using linked list.

Unit-II

Stacks: Concepts and implementation of stacks, operations on stack, conversion of infix to postfix notation, evaluation of postfix expression, recursion.

Queues: Concepts and implementation, operations on queues, dequeue, priority queues, circular queues and application.

Unit-III

Trees: Types, terminology, binary tree -representations, traversal, conversion of general tree to binary tree, binary search tree, threaded binary tree and height balanced tree.

Unit-IV

Graphs: Background, graph theory terminologies, representation of graphs- sequential & linked representation, path matrix, graph traversals- BFS, DFS, spanning trees, applications of graph.

Unit-V

Searching &Sorting: Linear search, binary search, bubble sort, selection sort, insertion sort, quick sort, merge sort, radix sort and heap sort, comparison between sorting techniques, hashing and collision resolution techniques.

RECOMMENDED BOOKS

- Data Structures, Algorithms and Applications in C++, SartajSahni, 2nd Edition.
- An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Mcgraw hill.
- Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.

COURSE OUTCOMES

After completion of this course, the students would be able to:

1. **Analyze** fundamental concepts of algorithms and their performance metrics
2. **Evaluate** the operations of linear and non-linear data structures
3. **Select** the suitable data structure for solving specific problems effectively
4. **Evaluate** the efficiency and applications of diverse data structures
5. **Formulate** optimal algorithmic solutions for diverse problems

Centre for Internet of Things

Python Programming: 3230224

COURSE OBJECTIVES

- To develop the understanding of algorithms, programming approaches and program documentation techniques in Python.
- To study the concepts of procedural and object oriented programming techniques in Python.
- To design and implement basic programming solutions using Python programming constructs.

Unit I

Introduction to Python: Formal and natural languages, Downloading and installing Python. Problem-solving methods and algorithm development. The first program, Variables, expressions, keywords, Operators, Expressions and statements, Interactive mode and script mode, Order of operations. Datatypes: Numeric, string, list tuple, dictionary, set.

Unit II

Function, ways of passing arguments to functions, user defined and inbuilt functions, lambda function. Control Statements: Conditional and unconditional branching, while loop, for loop, loop control statements, range function. Numeric, String, list, tuple, dictionary and set manipulation operations using loops and inbuilt manipulation functions. Packages and modules in python.

Unit III

Exception and File Handling: Errors vs exceptions, Exceptions handling with try block,handling multiple exceptions, writing your own exceptions,file handling modes, reading, writing and appending a file, Handling file exceptions.

Unit IV

Object oriented programming: Characteristics and features of OOPS, Classes and objects, constructors and destructors, defining member variables and functions, visibility modes, static members.

Unit V

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, polymorphism in python. Inheritance: Introduction, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath.

Centre for Internet of Things

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Function, ways of passing arguments to functions, user defined and inbuilt functions, lambda function. Control Statements: Conditional and unconditional branching, while loop, for loop, loop control statements, range function. Numeric, String, list, tuple, dictionary and set manipulation operations using loops and inbuilt manipulation functions. Packages and modules in python.

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Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, polymorphism in python. Inheritance: Introduction, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath.

Association, Aggregation and composition. Array manipulation and visualization using numpy and matplotlib libraries.

RECOMMENDED BOOKS

- Python Crash Course: A Hands-On, Project-Based Introduction to Programming, By Eric Matthes.
- Learn Python the Hard Way: thirdEdition T.R. Padmanabhan, Programming with Python, Springer, first Ed., 2016.
- Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning, first Ed., 2012.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define basics syntax and features of python programming language

CO2. solve computational problem using python language.

CO3. take part in online coding platforms.

CO4. inspect the python program for errors.

CO5. design a program using the features of object oriented concept.

CO6. construct the python code for real world problem using the libraries.

IV Semester

Syllabus

2020-2021

B.Tech.

in

Internet of Things(IoT)

Madhav Institute of Technology & Science

Gwalior-474005

COMPUTER ARCHITECTURE AND MICROPROCESSOR: 2230421

Course Objective: To provide the fundamental knowledge of a computer system and its processing units. To provide the details of input & output operations, memory management and performance measurement of the computer system. To understand how computer represents and manipulate data. To understand different processors and basic architecture of 8/16 bit microprocessors.

Course outcomes focused on employability/entrepreneurship and skill development

SNo.	Course Outcome (CO)	Mapping
1	**Describe** the computer architecture and microprocessor	Skill Development
2	**Explain** the fundamental concept to understand the working of computer architecture and microprocessor	Skill Development
3	**Explain** the basic concept of input output and memory organization	Skill Development
4	**Write** assembly language programming	Employability
5	**Build** a system using 8086 microprocessors, peripheral devices and controllers for solving practical problems	Skill Development
6	**Describe** the computer architecture and microprocessor	Skill Development

Unit 1:

Introduction: CPU structure and functions, processor organization, ALU, data paths, internal registers, status flags; System bus structure: Data, address and control buses. Processor control, micro-operations, instruction fetch, hardwired control, micro programmed control, microinstruction sequencing and execution.

Unit 2:

Instruction set principles, machine instructions, types of operations and operands, encoding an instruction set, assembly language programming, addressing modes and formats.

Unit 3:

Input-Output Organization: I/O organization; I/O techniques: interrupts, polling, DMA; Synchronous vs. asynchronous I/O.

Memory Organization: Memory system, internal and external memory, memory hierarchy, cache memory and its working, virtual memory concept.

Unit 4:

Clipping: Microprocessors: 8085 microprocessor architecture; Instruction set, instruction types and formats; Instruction execution, instruction cycles, different types of machine cycles and timing diagram. 16-bit microprocessors, 8086 architecture, registers, memory segmentation and addressing.

Unit 5:

Basic peripherals and interfacing: 8255, interfacing with LED's, ADC, DAC, stepper motors and I/O & Memory Interfacing, 8254, 8259, 8251.

Text Books:

1. Computer System Architecture, Morris Mano, PHI.
2. Microprocessor Architecture, Programming and Applications with the 8085, Gaonkar, Penram International Publishing (India) Pvt.Ltd.
3. Computer Organization, Carl Hamacher, THM.
4. Computer Architecture and Organization, J P Hayes, Mc-Graw Hills, New Delhi.
5. The Intel. Microprocessors, Architecture, Programming and Interfacing, B.B. Brey (PHI)
6. Microprocessor 8086: Architecture, Programming, and Interfacing, Sunil Mathur(PHI)
7. Advanced Microprocessor and Interfacing, D.V. Hall (Mc-Graw Hill)
8. Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing, A.K. Ray & K.M. Bhurchandi, Tata McGraw Hill.
9. Interfacing techniques in Digital Design with emphasis on Microprocessors, R.L. Krutz (John Wiley)

IOT EMBEDDED SYSTEMS DESIGN: 2230422

Course Objective: To understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions. To learn ARM microcontrollers to perform various tasks. To understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

Course outcomes focused on employability/entrepreneurship and skill development

SNo.	Course Outcome (CO)	Mapping
1	**Explain** the architecture and advanced features of embedded processors and microcontrollers	Skill Development
2	**Describe** the function of PIC/ARM processor registers, instruction pipeline and interrupts	Skill Development
3	**Use** the instructions, addressing modes, conditional instructions to program embedded processors and microcontrollers	Employability
4	**Analyze** the architectures, instructions, interfacing and applications of Raspberry Pi board	Skill Development
5	**Compare** advanced intel Galileo/Edison microprocessors with other classical microprocessors	Skill Development
6	**Explain** the architecture and advanced features of embedded processors and microcontrollers	Skill Development

Unit 1:

Embedded and Microcontroller Concepts: Introduction to embedded processors, Application Areas, Categories of embedded processors, Hardware architecture, Software architecture, Application software, Communication software, Introduction to Harvard & Von Neumann Architectures, CISC & RISC Architectures.

Unit 2:

Embedded Serial Communication: SPI, SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus), USB. Communication under IoT: IoT Protocol: MQTT, CoAP, XMPP and AMQT, IoT Communication Models, IoT Communication Technologies: Bluetooth, BLE, Zig-Bee, Zwave, NFC, RFID, LiFi, Wi-Fi, Interfacing of Communication Technologies, Embedded Programming.

Unit 3:

ARM: ARM design philosophy, data flow model and core architecture, registers, program status register, instruction pipeline, interrupts and vector table, operating modes and ARM processor families. Instruction Sets: Data processing instructions, addressing modes, branch, load, store instructions, PSR instructions, and conditional instructions.

Unit 4:

Raspberry Pi: Raspberry Pi board and its processor, Programming the Raspberry Pi, Communication facilities on Raspberry Pi (I2C, SPI, UART), Interfacing of sensors and actuators.

Unit 5:

Intel Galileo or Edison microprocessors for Embedded System and IoT, Application-specific integrated circuit (ASIC), Application-specific standard parts (ASSPs), System-on-Chip (SoC), Field-Programmable Gate Arrays (FPGA), Single Board Computers (SBC).

Text Books:

1. Muhammod Ali Mazidi, Rolin D. Mckinlay& Danny Sansey, "PIC Microcontroller and Embedded System SPI, UART using Assembly & C for PICI8," Pearson International Edition. 2008.
2. A. N. Sloss, D. Symes, and C. Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Elsevier, 2008.
3. S. Monk, "Programming the Raspberry Pi" McGraw-Hill Education, 2013
4. John .B. Peatman, "Design with PIC Microcontroller", Prentice Hall, 1997.
5. Steave Furber, "ARM system-on-chip architecture", Addison Wesley, 2000.

SOFTWARE ENGINEERING: 2230423

Course Objective: To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.To understand project management and risk management associated with various types of projects.To know basics of testing and understanding concept of software quality assurance and software configuration management process.

Course outcomes focused on employability/entrepreneurship and skill development

SNo.	Course Outcome (CO)	Mapping
1	**Analyze** the foundational concepts of software engineering.	Skill Development
2	**Discuss** advanced concepts in software design illustrating their interconnections and applications.	Skill Development
3	**Compare** various techniques for software project management and estimation.	Skill Development
4	**Implement** software using cutting-edge tools and techniques	Employability
5	**Develop** and test the software through different approaches.	Entrepreneurship

Unit 1:

Introduction to Software Engineering: Definition, Software Engineering-Layered Technology, Software Characteristics and Components, **Software Model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection Criteria of Model**: Characteristics of Requirements, Status of Development Team, Users Participation, Type of Project and Associated Risk.

Unit 2:

Requirement Engineering: Definition, Requirement Engineering Activity ,**Types of Requirement-** Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

Unit 3:

Design Concept, Principle and Methods: Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural Design, Procedural Design, Data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

Unit 4:

Software Metrics, Project Management and Estimation: Metrics in Process and Project Domains, Software Measurement, Software Quality Metrics, **Project Management-** Basics-People, Product, Process, Project, **Estimation-** Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) Based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

Unit 5:

Software Testing: Definitions, Software Testing Life Cycle (STLC), , Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic Issues, Criteria for Completion

of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

Text Books:

1. Software Engineering, Sommerville, Pearson.
2. Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill.
3. Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication.
4. Software Engineering, Rajib Mall, PHI

IOT ARCHITECTURE & PROTOCOLS: 2230424

Course Objective: Familiarize the student with the basic taxonomy and terminology of the IOT Architecture & Protocols.Provide detailed knowledge about various layers, protocols and devices that facilitate IoT service.

Course outcomes focused on employability/entrepreneurship and skill development

SNo.	Course Outcome (CO)	Mapping
1	**Explain** various concepts, terminologies, and architecture of IoT systems	Skill Development
2	**Describe** the architectural views of IoT and various design challenges	Skill Development
3	**illustrate** data link and network layer protocols.	Skill Development
4	**Analyze** various transport and session layer Protocols	Employability
5	**Explain** the need of IoT service layer protocols.	Skill Development

Unit 1:

Introduction: IoT architecture outline, standards - IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, IoT Communication models, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics.

Unit 2:

IoT Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints.

Unit 3:

IoT Data Link Layer & Network Layer Protocols: PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4,IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

Unit 4:

IoT Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS), Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.

Unit 5:

IoT Service Layer Protocols & Security Protocols: Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC802.15.4 , 6LoWPAN, RPL, Application Layer: UPnP, SCADA, Authentication Protocols.

Text Books:

1. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, ISBN: 978-1-118-47347-4, Willy Publications ,2016
2. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand,StamatisKarnouskos, David Boyle, 1st Edition, Academic Press, 2015.

3. Architecting the Internet of Things, Bernd Scholz-Reiter, Florian Michahelles, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
4. Sensors, Actuators and Their Interfaces, N. Ida, Scitech Publishers, 2014.
5. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, CISCO Press, 2017
6. Internet of Things: Architectures, Protocols and Standards , Simone Cirani , Gianluigi Ferrari , Marco Picone , Luca Veltri, Willy Publications,2018.

NETWORK & WEB SECURITY: 2230425

Course Objective: To provide conceptual understanding of network security principles, issues, challenges and mechanisms. To understand how to apply encryption techniques to secure data in transit across data networks. To explore the requirements of real-time communication security and issues related to the security of web services.

Course outcomes focused on employability/entrepreneurship and skill development

SNo.	Course Outcome (CO)	Mapping
1	**Analyze** cryptographic algorithms, hash algorithms, and authentication mechanisms.	Skill Development
2	**Describe** fundamental concepts of number theory, attacks, and security principles, for real-world applications.	Skill Development
3	**Apply** the number theory and algorithms to achieve security principles,	Skill Development
4	**Analyze** causes of various network attacks and implications.	Skill Development
5	**Develop** algorithms to predict potential attacks and controls associated with IP.	Employability

Unit 1:

Security: Principles and Attacks, Basic Number Theory: Prime Number, Congruence's, Modular Exponentiation, Fundamentals of Cryptography, Steganography, Cryptanalysis, Code Breaking, Block Ciphers and Steam Ciphers, Substitution Ciphers, Transposition Ciphers, Caesar Cipher, Play-Fair Cipher, Hill Cipher, Cipher Modes of Operation.

Unit 2:

Cryptography: Symmetric Key Cryptography, Public Key Cryptography, Principles of Public Key Cryptosystem, Classical Cryptographic Algorithms: DES, RC4, Blowfish, RSA, Distribution of Public Keys and Key Management, Diffie-Hellman Key Exchange.

Unit 3:

Hash Functions: Hash Functions, One Way Hash Function, SHA (Secure Hash Algorithm).Authentication: Requirements, Functions, Kerberos, Message Authentication Codes, Message Digest: MD5, SSH (Secure Shell), Digital Signatures, Digital Certificates.

Unit 4:

IP & Web Security Overview: SSL (Secure Socket Layer), TLS (Transport Layer Security), SET (Secure Electronic Transaction). IDS (Intrusion detection system): Statistical Anomaly Detection and Rule-Based Intrusion Detection, Penetration Testing, Risk Management. Firewalls: Types, Functionality and Polices.

Unit 5:

Phishing: Attacks and its Types, Buffer Overflow Attack, Cross Site Scripting, SQL Injection Attacks, Session Hijacking. Denial of Service Attacks: Smurf Attack, SYN Flooding, Distributed Denial of Service. Hacker: Hacking and Types of Hackers, Foot Printing, Scanning: Types: Port,

Network, Vulnerability), Sniffing in Shared and Switched Networks, Sniffing Detection & Prevention, Spoofing.

Text Books:

1. Cryptography and Network Security, William Stallings, Pearson Education.
2. Cryptography and Network Security, Atul Kahate, McGraw Hill Education.
3. Incident Response and Computer Forensics, Kevin Mandia, Chris Prosise, Tata McGraw Hill

VI Semester

Syllabus

2021-2022

B.Tech.

in

Internet of Things(IoT)

Madhav Institute of Technology & Science
Gwalior-474005

Annexure-5

Compiler Design: 230601

Course Objective:

- To learn finite state machines and context free grammar.
- To learn, various phases of compiler
- To understand process of compiler implementation.

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Define** the concepts of finite automata and context free grammar.	Skill Development
2	**Build** the concept of working of compiler.	Skill Development
3	**Examine** various parsing techniques and their comparison.	Employability
4	**Compare** various code generation and code optimization techniques.	Skill Development
5	**Analyze** different tools and techniques for designing a compiler.	Employability
6	**Design** various phases of compiler.	Employability

Unit-I

Overview of Translation Process: Introduction to Compiler, Translator, Interpreter and Assembler, Overview and use of Linker and Loader, Major Data Structures in Compiler, Other Issues in Compiler Structure, BOOT Strapping and Porting, Compiler Structure: Analysis-Synthesis Model of Compilation, Various Phases of a Compiler, Tool Based Approach to Compiler Construction.

Unit-II

Lexical Analysis: Input Buffering, Symbol Table, Token, Recognition of Tokens, Lexeme and Patterns, Difficulties in Lexical Analysis, Error Reporting and Implementation. Regular Grammar & Language Definition, Transition Diagrams, Design of a Typical Scanner usingLEX.

Unit-III

Syntax Analysis: Context Free Grammars (CFGs), Ambiguity, Basic Parsing Techniques: Top Down Parsing, Recursive Descent Parsing, Transformation on the Grammars, Predictive Parsing LL(1) Grammar, Bottom-UP Parsing, Operator Precedence Parsing, LR Parsers (SLR, CLR, LALR), Design of a Typical Parser Using YACC.

Unit-IV

Semantic Analysis: Compilation of Expression, Control, Structures, Conditional Statements, Various Intermediate Code Forms, Syntax Directed Translation, Memory Allocation and Symbol Table Organizations, Static and Dynamic Array Allocation, String Allocation, Structure Allocation etc., Error Detection Indication and Recovery, Routines or Printing Various Lexical, Syntax and Semantic Errors.

Unit-V

Code Generation and Code Optimization: Issues, Basic Blocks and Flow Graphs, Register Allocation, Code Generation, DAG Representation of Programs, Code Generation from DAGS, Peep-hole Optimization, Code Generator Generators, Specification of Machine. Code Optimization:

Source of Optimizations, Optimization of Basic Blocks, Loops, Global Data Flow Analysis, Solution to Iterative Data Flow Equations, Code Improving Transformations, Dealing with Aliases, Data Flow Analysis of Structured Flow Graphs.

Text Books:

1. Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. D. Ullman, Pearson Education.
2. Compiler Construction: Principles and Practice, K.C. Louden, Cengage Learning.

Data Mining & Pattern Warehousing: 230602

Course Objective:

- To understand the significance of data mining in real-world perspective.
- To gain understanding of data mining techniques, algorithms and commonly used tools.
- To develop ability for applying data mining techniques and tools for solving real-world problems.

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Describe** basics of data mining including data types, advanced databases, and functionalities	Skill Development
2	**Choose** appropriate data pre-processing techniques for specific requirements	Skill Development
3	**Compare** various association rule mining algorithms for practical applications	Skill Development
4	**Explain** different methods for classification, prediction, and cluster analysis	Employability
5	**Apply** the concept of pattern warehousing to address intricate problems across domains	Employability
6	**Describe** basics of data mining including data types, advanced databases, and functionalities	Employability

Unit - I

Introduction: Motivation, importance, Data type for Data Mining: Relational Databases, Data Ware-Houses. Transactional Databases, Advanced Database System and Its Applications, Data Mining Functionalities, Concept/Class Description, Association Analysis Classification & Prediction, Cluster Analysis, Outliner Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.

Unit - II

Data Pre-processing: Data Cleaning, Data Integration and Transformation and Data Reduction. Discretization and Concept Hierarchy Generation. Data Mining Primitives Languages and System Architectures, Concept Description, Characterization and Comparison Analytical, Characterization.
Data Warehouse and OLTP Technology for Data Mining: Differences between Operational Database Systems & Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology.

Unit – III

Mining Association Rules in Large Databases: Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single Dimensional Boolean Association Rules from Transactional Databases: The Apriori Algorithm, Generating Association Rules from Frequent Items, Improving the Efficiency of Apriori, other Algorithms & their Comparison, Mining Multilevel Association Rules, Multidimensional Association Rules, Constraint Based Association Rule Mining.

Unit - IV

Classification & Prediction and Cluster Analysis: Issues Regarding Classification & Prediction, Different Classification Methods, Prediction, Cluster Analysis, Major Clustering Methods, Currently Available Tools.

Unit - V

Pattern Warehousing System: Pattern Warehouse, Process flow for Pattern Warehouse, Benefits of Pattern Warehousing, Difference between Pattern Warehousing and Data Warehousing, Architectural aspects of Pattern Warehousing, Types of Pattern Warehouses, Challenging Issues in Pattern Warehouse, Profitable Pattern Mining, Hesitation Mining, Case Study in Stock Market, Super Market.

Text Books:

1. Data Mining: Concepts and Techniques, Han and Kamber, Morgan Kaufmann Publications.
2. Data Mining Techniques, A. K. Pujari, Universities Press Pvt. Ltd.

Artificial Intelligence & Machine Learning: 230603

Course Objective:

- To provide the fundamental knowledge of Artificial Intelligence and Machine Learning.
- To present the basic representation and reasoning paradigms used in AI & ML.
- To understand the working of techniques used in AI & ML.

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Define** basic concepts of Artificial Intelligence & Machine Learning.	Skill Development
2	**Illustrate** various techniques for search and processing.	Skill Development
3	**Identify** various types of machine learning problems and techniques.	Skill Development
4	**Analyse** various techniques in Artificial Intelligence, ANN & Machine Learning.	Employability
5	**Apply** AI and ML techniques to solve real world problems.	Employability
6	**Build** AI enabled intelligent systems for solving real world problems.	Employability

Unit I

Introducing Artificial Intelligence: Definition, Goals of AI, Task of AI, Computation, Psychology and Cognitive Science, Perception, Understanding and Action. Artificial Intelligence vs Machine Learning vs Deep Learning and other related fields. Applications of Artificial intelligence and Machine Learning in real world.

Unit II

Problem, Problem Space and Search: Production System, Blind Search: BFS & DFS, Heuristic Search, Hill Climbing, Best First Search.
Introduction to Neural Networks: History, Biological Neuron, Artificial Neural Network, Neural Network Architectures, Classification, & Clustering.

Unit III

Introduction to Machine Learning: Traditional Programming vs Machine Learning.
Key Elements of Machine Learning: Representation, Process (Data Collection, Data Preparation, Model Selection, Model Training, Model Evaluation and Prediction), Evaluation and Optimization. Types of Learning: Supervised, Unsupervised and Reinforcement Learning. Regression vs Classification Problems.

Unit IV

Supervised Machine Learning: Linear Regression: Implementation, Applications & Performance Parameters, Decision Tree Classifier, Terminology, Classification vs Regression Trees, Tree Creation with Gini Index and Information Gain, IDE3 Algorithms, Applications and Performance Parameters. Random Forest Classifier, Case Study on Regression and Classification for solving real world problems.

Unit V

Unsupervised Machine Learning: Introduction, Types: Partitioning, Density Based, DBSCAN, Distribution Model-Based, Hierarchical, Agglomerative and Divisive, Common Distance Measures, K-Means Clustering Algorithms, Case Study on Clustering for solving real world problems.

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
2. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
3. Introduction to AI & Expert System: Dan W. Patterson, PHI.
4. Pattern Recognition and Machine Learning, Christopher M. Bishop
5. Introduction to Machine Learning using Python: Sarah Guido
6. Machine Learning in Action: Peter Harrington

Syllabus
I Semester

2023-2027

B.Tech.

in

Internet of Things(IoT)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
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NAAC ACCREDITED WITH A++ GRADE
Centre for Internet of Things

Syllabus
I Semester

2023-2027

B.Tech.

in

Internet of Things(IoT)

Madhav Institute of Technology & Science
Gwalior-474005

Centre for Internet of Things

INTRODUCTION TO INTERNET OF THINGS (IoT)
3230121/2230121

L	T	P	Total Credits
4	-	-	4

COURSE OBJECTIVES

- To understand basic terminology of Internet of Things.
- To understand technology behind interaction between things.
- To understand basic terminology of Internet of Things.

Unit I

Internet of things (IoT): Introduction, Evaluation of IoT concept, Definition, Key features and components, IoT Building block, IoT Characteristics, Advantages and Disadvantages.

Unit II

IoT Applications, IoT application structures and driver technologies : collection, transmission, processing, managing, utilization phase, Telematics and Telemetry, Telematics vs IoT, Machine-to-Machine communication, M2M vs IoT, IoE, IIoT, V2V, V2X.

Unit III

IoT hardware and software, Study of IoT Sensors, Actuators, Wearable electronics, Standard devices, Concept of Cloud, Edge, Fog and Roof computing in IoT, Introduction to communication, Components of communication system, Modes of communication, Types of data transmission, IoT communication models : Device-to-Device, Device-toCloud, Device-to-Gateway, and Back-End Data-Sharing, IoT Connectivity and Management.

Unit IV

Introduction to Internet and Networking Protocol, IoT protocols, Types of IoT Networks, Introduction of WSN, RF wireless sensors, RFID, WiFi, Bluetooth, IP Based Cellular Networks & 3G, 4G.

Unit V

IoT Challenges: Interoperability, Precision, Data volume and scalability, Internet connectivity, **IoT Security**: Security vulnerabilities in overall IoT system,

Securityvulnerabilities at different layers of IoT architecture, IoT Privacy and Trust, Standardization gap.

RECOMMENDED BOOKS

- Internet of Things from Hype to Reality, The Road to Digitization, Ammar Rayes andSamer Salam, Second Edition, Springer
- Internet of Things (IoT) Technology, Economic View And Technical Standardization,Etienne Schneider, Version 1.0, ILNAS
- Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, DimitriosSerpanos and Marilyn Wolf, Springer
- Data Communications and Networking, Behrouz A Forouzan, Fourth Edition, McGrawHill Education

COURSE OUTCOMES

After completion of the course students would be able to:

CO1.explain basic terminology of Internet of Things.

CO2.illustrate the role of communication in IoT.

CO3.identify and use various protocols devices that are used in IoT.

CO4.classify networking, cloud and fog computing concept for data management.

CO5.investigate challenges, security and privacy.

CO6.discuss different IoT enabled techniques behind interaction between things.

Centre for Internet of Things

COMPUTER PROGRAMMING
3230122/2230122

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To develop the understanding of algorithms, programming approaches and program documentation techniques.
- To study the concepts of procedural and object oriented programming.
- To design and implement basic programming solutions using programming constructs.

Unit I

Introduction to Programming, Types of Computer Programming Languages, Program Execution and Translation Process, Problem Solving using Algorithms and Flowcharts. Introduction to C++ Programming: Data Types, Constants, Keywords, Variables, Input/Output, Operators &Expressions, Precedence of Operators.

Unit II

Control Statements and Decision Making: gotostatement, if statement, if-else statement, nesting of if statements, switch statement, while loop, do...while loop, for loop, nesting of for loops, break and continue statement. Function Basics, Function Prototypes, Passing Parameter by Value and by Reference, Default Arguments, Recursion. Arrays: One Dimensional Arrays, Multidimensional Arrays, Passing Arrays to Functions.

Unit III

Strings, Pointers, Structures and File Handling:Operations on Strings, Basics of Pointers & Addresses, Reference Variable, Pointer to Pointer, Pointer to Array, Array of Pointers, Pointer to Strings. Dynamic Memory Allocation using New and Delete Operators. Structures & Union, Pointer to Structure, Self-Referential Structures. File Concepts, Study of Various Files and Streams, Operations on Files.

Unit IV

Object Oriented Paradigm, Features of OOPS, Comparison of Procedural Oriented Programming with Object Oriented Programming, Abstract Data Types, Specification of Class, Visibility Modes, Defining Member Functions, Scope Resolution Operator, Constructors, its types, and Destructors, Creating of Objects, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Friend Function.

Unit V

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading. Inheritance: Introduction, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath.

RECOMMENDED BOOKS

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusam.
- Fundamentals of Programming C++, Richard L. Halterman.

COURSE OUTCOMES

After completing this, the students will be able to:

CO1.identify situations where computational methods and computers would be useful.

CO2.develop algorithms and flowchart for a given problem.

CO3.understand the concepts of procedural programming.

CO4.explain the concepts of object oriented programming and its significance in the real world.

CO5.analyze the problems and choose suitable programming techniques to develop solutions.

CO6.develop computer programs to solve real world problems.

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading. Inheritance: Introduction, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath.

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CO6.develop computer programs to solve real world problems.

Centre for Internet of Things

DIGITAL LOGIC DESIGN
3230123/2230123

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To understand the fundamental operating components of Digital Computers.
- To learn various number systems, boolean algebra employed in digital computers.
- To understand the concepts of counters, latches and flip-flops.

Unit I

Introduction to Digital Electronics, Needs and Significance, Different Number System: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic's, Binary Codes: BCD, ASCII Codes.

Unit II

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications.

Unit III

Combinational Circuits, Half Adder, Full Adder, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers.

UnitIV

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

Unit V

Introduction to Memory, Memory Decoding, Programmable Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), SequentialProgrammable Logic Device (SPLD), Complex Programmable Logic Device (CPLD), Field-Programmable Gate Array (FPGA), Digital Logic Design: RTLand DTL Circuits, TTL.

RECOMMENDED BOOKS

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.
- Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley.

COURSE OUTCOMES

Centre for Internet of Things

After completion of the course students would be able to:

CO1. explain the basic components and functional units to define computer architecture

CO2. explain different number systems and basic operations employed at machine level.

CO3. develop the understanding of combinational circuits.

CO4. analyse the basic concept of sequential circuits.

CO5. compare and differentiate various memories used in Computers.

CO6. reducethe boolean functions to mitigate hardware complexity issues.

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Centre for Internet of Things

Syllabus
III Semester

2022-2026

B.Tech.

in

Internet of Things(IoT)

Madhav Institute of Technology & Science
Gwalior-474005

Centre for Internet of Things

COMPUTER NETWORKS AND PROTOCOLS
2230321

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking & Protocols.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable students to deal with various networking problems such as flow control, error control and congestion control.

Unit-I

Introduction: Computer Network Types, OSI Reference Model & TCP/IP Reference Mode, Circuit Switching, Message Switching & Packet Switching, Frequency Division Multiplexing, Wavelength Division Multiplexing & Time Division Multiplexing, ISDN, SONET.

Physical Layer : Data Transmission Modes, Network topologies, Line Coding, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided, Networking Devices, Performance Criteria.

Unit-II

Data Link Layer: Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- Channel Allocation Problem, Pure ALOHA ,Slotted ALOHA, CSMA ,CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5,HDLC.

Unit-III

Network Layer Protocols: Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Routing Protocols, Flooding, Connection Oriented & Connectionless Service, IP Addressing,IPV4, IPV6, Internet Protocol Datagram, Fragmentation, ICMP, IGMP.

Unit-IV

Transport Layer Protocols: Datagram Protocol (UDP) - Process To Process Communication, Port Number, Socket Address, User Datagram, UDP Operation. TCP Services, Process To Process Communication, Stream Delivery Service, Full Duplex Communication, Connection Oriented Service, Reliable Service, TCP Features- Numbering System, Flow Control, Error Control, Congestion Control , TCP Segment, Flow Control-Sliding Window Protocol, Silly

Window Syndrome Error Control-Checksum, Acknowledgement, Retransmission, Congestion Control.

Unit-V

Application Layer Protocols: Introduction, Design Issues, Presentation Layer- Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer- Remote Login, File Transfer & Electronic Mail. Domain Name System (DNS), Telnet, FTP, TFTP, Email Protocol: SMTP, POP, IMAP.

RECOMMENDED BOOKS

- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.
- TCP/IP Protocol Suite, B. A. Fourozan,Tata McGraw Hill
- Internetworking with TCP/IP, Douglas E. Comer, Publisher- PHI, New Delhi
- TCP/IP Illustrated by Richard Stevens, Publisher- Addison – Wesley.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

CO1. explain the fundamental concepts of computer network.

CO2. illustrate the basic taxonomy & terminologies of computer network protocols.

CO3. develop a concept for understanding advance computer network.

CO4. build the skill of IP addressing and routing mechanism.

CO5. predict the performance of computer network in congestion and internet.

CO6. construct the network environment for implementation of computer networking concept.

Centre for Internet of Things

DESIGN & ANALYSIS OF ALGORITHMS
2230322

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To introduce the topic of algorithms as a precise mathematical concept.
- To study the techniques like recursion, divide and conquer, dynamic programming, greedy approach, backtracking and branch and bound.
- To practice their skills on many well-known algorithms and data structures designed to solve real-life problems.

Unit-I

Introduction to Computational Model: Algorithms and its Importance, Recurrences and Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithm, Review of Sorting & Searching Algorithms, **Basic Tree and Graph Concepts:** B-Trees and Traversal Techniques, Topological sort.

Unit-II

Divide and Conquer Method: Introduction and its Examples such as Finding the Maximum and Minimum, Binary Search, Merge Sort, Quick Sort and Strassen's Matrix Multiplication and Additional Real World Problems on Divide and Conquer.

Unit-III

Greedy Method: Introduction, Characteristics, Examples of Greedy Methods such as Single-Source Shortest Paths, **Minimum Cost Spanning Trees** :Prims's and Kruskal's Algorithm, Knapsack Problem, Dijkstra'sSingle Source Shortest Path Algorithm, Optimal Storage on Tapes.

Unit-IV

Dynamic Programming: Introduction, The Principle of Optimality, Examples of Dynamic Programming Methods such as – 0/1 Knapsack, Traveling Salesman Problem, Floyd's All Pairs Shortest Path, Longest Common Subsequence and Reliability Design, Matrix Chain Multiplication.

Unit-V

Backtracking: Concept and its Examples like 4-Queen's Problem, Knapsack problem Hamiltonian Circuit Problem, Graph Coloring Problem etc. **Branch & Bound:** Introduction

and its Examples like - Traveling Salesperson Problem etc. **NP-Completeness:** Introduction, Class P and NP, Polynomial Reduction, NP-Hard and NP- Complete Problems.

RECOMMENDED BOOKS

- Fundamentals of Computer Algorithms, Horowitz &Sahani, Universities press.
- Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.
- Design & Analysis of Computer Algorithms, Ullmann, Pearson.
- Algorithm Design, Michael T Goodrich, RobartoTamassia, Wiley India.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. demonstrate a familiarity with major algorithms and data structures.
CO2. idenify important algorithmic design paradigms and methods of analysis.
CO3. analyze the performance of algorithms.
CO4. compare variousalgorithm design techniques.
CO5. select the design technique to solve any real world problem.
CO6. design efficient algorithm using various design techniques.

Centre for Internet of Things

COMPUTER GRAPHICS & MULTIMEDIA
2230323

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To become familiar with computer graphics techniques and display devices.
- To enhance the proficiency in image representations, 2D and 3D graphics transformations.
- To develop awareness with various illumination, color models and multimedia system.

Unit-I

Introduction to Computer Graphics: Interactive Computer Graphics, Application of Computer Graphics, Random and Raster Scan Displays, Storage Tube Graphics Display, Calligraphic Refresh Graphics Display, Flat Panel Display, Refreshing, Flickering, Interlacing, Resolution, Bit Depth, Aspect Ratio etc.

Unit-II

Scan Conversion Technique: Image representation, Line drawing: DDA, Bresenham's Algorithm. Circle Drawing: Mid-Point, DDA, Bresenham's Circle Generation Algorithm, Ellipse Generation Algorithm, Curves: Parametric Function, Bezier Method, B-Spline Method.

Unit-III

2D & 3D Transformations: Translation, Rotation, Scaling, Reflection, Shearing, Inverse Transformation, Composite Transformation, World Coordinate System, Viewing Transformation, Representation of 3D object on Screen, Parallel and Perspective Projections.

Unit-IV

Clipping: Point clipping, Line Clipping, Simple Visibility Line Clipping Algorithm, Polygon Clipping, Hidden Surface Elimination: Z- Buffer algorithm and Painter's Algorithm, Area Filling, **BasicIllumination Models:** Diffuse Reflection, Specular Reflection, Phong Shading, Gouraud Shading, Color Models: RGB, YIQ, CMY, HSV.

Unit-V

Multimedia System: An Introduction, Multimedia hardware and software, Multimedia System Architecture, Multimedia Applications and evolving technologies, Multimedia Authoring. Data & File Format standards, Sampling; Compression standards, Compression through spatial and temporal redundancy.

RECOMMENDED BOOKS

- Donald Hearn and M.P. Becker: Computer Graphics, PHI Publication.

- FoleyVandam, Feiner, Hughes: Computer Graphics principle and Practice
- Rogers:Principles of Computers Graphics, TMH
- Sinha and Udai: Computer Graphics, TMH
- Prabhat K. Andleigh, Kiran Thakrar : Multimedia Systems Design, Prentice Hall PTR

COURSE OUTCOMES

After completion of the course students will be able to:

CO1. explore various display devices and applications of computer graphics.

CO2. illustrate various scan conversion techniques like line, circle, curve and shape drawing algorithms.

CO3. apply 2-dimensional, 3-dimensional transformations and projections on images.

CO4. classify methods of image clipping and various algorithms for line and polygon clipping.

CO5. apply appropriate filling algorithms, hidden surface elimination algorithm on images.

CO6. summarize various color models, shading methods and multimedia system.

OPERATING SYSTEM
2230324

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

Unit I

Basics of Operating System: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Unit II

Process Management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

Unit III

Process Synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Unit IV

Memory Management: Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit V

Storage Management: Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

RECOMMENDED BOOKS

- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.

- Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

CO1. tell the basic concept of operating systems.

CO2. explain the working procedure of the operating system.

CO3. analyze the various operating system problems and issues.

CO4. develop the solutions for various operating system problems and issues.

CO5. measure the performance of various scheduling and allocation techniques.

CO6. test the working of various scheduling and allocation techniques.

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Syllabus
V Semester

2021-2025

B.Tech.

in

Internet of Things(IoT)

Madhav Institute of Technology & Science
Gwalior-474005

DISCRETE STRUCTURES
160511

L	T	P	Total Credits
3	1	-	4

COURSE OBJECTIVES

- To perceive the knowledge of basic algebra
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer engineering
- To familiarize the discrete numeric function and generating function

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Unit-I

Finite and Infinite Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Multisets, Functions and Relations, Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains, Pigeonhole Principle.

Unit-II

Prepositional Logic, Syntax, Semantics of ATF (Atomic Formula), WFF (Well Formed Formula's),Validity and Satisfiability of WFF by Quine's Method, Normal and Closure Form of Prepositional Calculus.

Unit-III

Introduction and Basic Terminology of Graphs, Planner Graphs, Multi-Graphs and Weighted Graph, Shortest Path in Weighted Graph, Introduction to Eularian Paths and Circuits, Hamiltonian Paths and Circuits, Introduction to Trees, Rooted Trees, Path Length in Rooted Trees, Spanning Trees and CutTrees.

Unit-IV

Introduction to Discrete Numeric Functions and Generating Functions, Introduction to Recurrence Relations and Recursive Algorithms, Linear Recurrence Relations With Constant Coefficients, Homogeneous Solutions, Particular Solutions and Total Solutions.

Unit-V

Introduction to Group, Subgroups, Generations and Evaluation of Power, Cosets and Lagrange's Theorem, Group Codes, Isomorphism and Automorphism, Homomorphism and Normal Sub Groups, Ring, Integral Domain and Field.

RECOMMENDED BOOKS

- J. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science. NarsinghDeo: Graph Theory.
- Kenneth Rosen: Discrete mathematics and its applications (6th edition).2006. McGraw-Hill
- C. Liu, D. Mohapatra: Elements of Discrete Mathematics. 2008. Tata McGraw-Hill.
- T. Koshy: Discrete mathematics with applications.2003. Academic Press.
- J. Hein: Discrete structures, logic and computability.2009. Jones & Bartlett Publishers.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concept of set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure.

CO2. illustrate the knowledge of course content and distinguish between them in terms of their applications.

CO3. identify the concepts of graph and tree for solving problems in the computer science.

CO4. apply the concepts of studied topics with suitable technique faced in engineering problems

CO5. analyze the set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure to examine the real world problem.

CO6. build analytical skill and interpret applications of engineering beneficial in real time troubleshooting.

Centre for Internet of Things

THEORY OF COMPUTATION
230503

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVE

- To understand computability, decidability, and complexity through problem solving.
- To analyse and design abstract model of computation & formal languages
- To understand and conduct mathematical proofs for computation and algorithms.

Unit-I

Introduction of Automata Theory: Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa.

Unit-II

Types of Finite Automata: Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Meaning of union, intersection, concatenation and closure, 2 way DFA.

Unit-III

Grammars: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.

Unit-IV

Push down Automata: example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA, Petrinet model.

Unit-V

Turing Machine: Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability and Recursively Enumerable Languages. decidability. decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem.

RECOMMENDED BOOKS

- Introduction to Automata Theory Language & Computation, Hopcroft & Ullman, Narosa Publication.

- Element of the Theory Computation, Lewis &Christors, Pearson.
- Theory of Computation, Chandrasekhar & Mishra, PHI.
- Theory of Computation, Wood, Harper & Row.
- Introduction to Computing Theory, Daniel I-A Cohen, Wiley.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concepts of switching and finite automata theory & languages.

CO2. relate practical problems to languages, automata, computability and complexity.

CO3. construct abstract models of computing and check their power to recognize the languages.

CO4. analyze the grammar, its types, simplification and normal form.

CO5. interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.

CO6. develop an overview of how automata theory, languages and computation are applicable in engineering application.

SOFT COMPUTING TECHNIQUES
230505

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals, Program the related algorithms and Design the required and related systems.
- To understand the fundamental theory and concepts of neural networks, several neural network paradigms and its applications.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Unit-I

Introduction to Soft Computing: Soft Computing v/s Hard Computing, Basic models of Artificial Neural Networks, Terminologies of ANNs McCulloch-Pitts Neurons, Linear Separability, Hebb Network, Supervised Learning Networks: Introduction, Perceptron Networks, Back Propagation Networks, Radial Basis Function Networks, Hopefield networks.

Unit-II

Fuzzy Set Theory: Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Fuzzy rules, Fuzzy Reasoning, Defuzzification: Lembda-Cuts for Fuzzy sets (Alpha-Cuts), Lembda-Cuts for Fuzzy Relations. Fuzzy Inference System: Introduction, Mamdani Fuzzy Model, Takagi-Sugeno Fuzzy Model.

Unit-III

Evolutionary Algorithm: Traditional optimization and Search Techniques, Basic Terminologies in GA, Operators in Genetic Algorithm, Stopping Condition for Genetic Algorithm Flow, Classification of Genetic Algorithm, Comparison with Evolutionary algorithm, Application of Genetic algorithm.

Unit-IV

Introduction to Nature-Inspired Optimization Algorithms: Particle Swarm Optimization (PSO) Algorithm, Differential Evolution (DE) Algorithm, Artificial Bee Colony (ABC) Algorithm, Ant Colony Optimization (ACO) Algorithm, Cuckoo Search (CS), Firefly Algorithm (FA), Immune Algorithm (IA), Grey Wolf Optimization (GWO), Spider Monkey Optimization.

Unit-V

Hybrid Soft Computing Techniques: Introduction, Neuro-fuzzy Hybrid system, Adaptive Neuro fuzzy inference system(ANFIS), Genetic Neuro Hybrid system, Application of Soft Computing Techniques.

RECOMMENDED BOOKS

- Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa , Wiley Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications- S. Rajasekaran& G.A. VijayalakshmiPai, PHI.
- Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms, Samir Roy and Udit Chakraborty, Pearson.
- Neural Networks and Learning Machines-Simon Haykin PHI.
- Fuzzy Logic and Engineering Application, Tomthy Ross, TMH.
- Evolutionary Optimization Algorithms, D. Simon (2013), Wiley.
- Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications, L. N. de Castro (2006), CRC Press.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define basic concepts of neural network and fuzzy systems.

CO2. compare solutions by applying various soft computing approaches on a given problem.

CO3. develop and train different supervised and unsupervised learning.

CO4. classify various nature inspired algorithms according to their application aspect.

CO5. compare the efficiency of various hybrid systems.

CO6. design a soft computing model for solving real world problems.

DATA SCIENCES IN IOT
230502

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand the key technologies in analytics for IoT.
- To understand the IoT data and requirement of analysis.
- To gain practical, hands-on experience with statistics programming languages, tools.

Unit-I

Introduction to Data Analytics: Defining IoT Analytics and Challenges: The situation, Defining IoT analytics, IoT analytics challenges, Business value concerns, IoT Analytics for the Cloud. Types of Analytics: Streaming Analytics, Spatial, Time Series and Prescriptive Analytics.

Unit-II

Data Collection: Getting to know your data, Types of Data, Data collection strategies, Data Pre-processing, Feature engineering with IoT data, Exploratory Data Analytics, Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis.

Unit-III

Data Visualization and Representation: Model Development Simple and Multiple Regression, Model Evaluation using Visualization, Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making, Box Plots, Pivot Table, Heat Map.

Unit-IV

Strategies to Organize Data for Analytics: Linked Analytical Datasets, Linking together datasets, Managing data lakes, Data retention strategy, Economics of IoT Analytics, Cost considerations for IoT analytics, Thinking about revenue opportunities, The economics of predictive maintenance example, Data Analytics Life Cycle.

Unit-V

Application of Analytics in IoT: IoT based applications, Healthcare, Marketing, Finance, Smart cities, Cyber security, video surveillance, Agriculture and Weather Forecasting and other domains; Real Time IoT based data analysis.

RECOMMENDED BOOKS:

- JojoMoolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.
- Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
- David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
- Andrew Minteer, Analytics for the Internet of Things "IoT" (1 ed.), Packt Publishing, 2017. ISBN 978-1787120730.

- HwaiyuGeng, Internet of Things and Data Analytics Handbook (1st st ed.), Wiley, 2017. ISBN 978-1119173649.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the fundamentals of data science and its importance.
CO2. classify the evolution, roles, stages in data science projects.
CO3. analyze the pre-processing and data reduction strategies.
CO4. explain the different data visualization and representation techniques.
CO5. evaluate the performance of algorithms in data science.
CO6. design the different real time applications of data science in IoT.

EMBEDDED SYSTEM & IOT
230504

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions
- To learn ARM microcontrollers to perform various tasks.
- To understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

Unit-I

Embedded and Microcontroller Concepts: Introduction to embedded processors, Application Areas, Categories of embedded processors, Hardware architecture, Software architecture, Application software, Communication software, Introduction to Harvard & Von NeumannArchitectures, CISC & RISC Architectures.

Unit-II

Embedded Serial Communication: SPI, SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus), USB. Communication under IoT: IoT Protocol: MQTT, CoAP, XMPP and AMQT, IoT Communication Models, IoT Communication Technologies: Bluetooth, BLE, Zig-Bee, Zwave, NFC, RFID, LiFi, Wi-Fi, Interfacing of Communication Technologies, Embedded Programming.

Unit-III

ARM: ARM design philosophy, data flow model and core architecture, registers, program status register, instruction pipeline, interrupts and vector table, operating modes and ARM processor families. Instruction Sets: Data processing instructions, addressing modes, branch, load, store instructions, PSR instructions, and conditional instructions.

Unit-IV

Raspberry Pi: Raspberry Pi board and its processor, Programming the Raspberry Pi, Communication facilities on Raspberry Pi (I2C, SPI, UART), Interfacing of sensors and actuators.

Unit-V

Intel Galileo or Edison microprocessors for Embedded System and IoT, Application-specific integrated circuit (ASIC), Application-specific standard parts (ASSPs), System-on-Chip (SoC), Field-Programmable Gate Arrays (FPGA), Single Board Computers (SBC).

RECOMMENDED BOOKS

- Muhammod Ali Mazidi, Rolin D. Mckinlay& Danny Sansey, "PIC Microcontroller and Embedded System SPI, UART using Assembly & C for PICI8," Pearson International Edition, 2008.
- A. N. Sloss, D. Symes, and C. Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Elsevier, 2008.
- S. Monk, "Programming the Raspberry Pi" McGraw-Hill Education, 2013
- John .B. Peatman, "Design with PIC Microcontroller", Prentice Hall, 1997.
- SteaveFurber, "ARM system-on-chip architecture", Addison Wesley, 2000.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the basic concepts of embedded systems and microcontroller.

CO2. explain the architecture and advanced features of embedded processors and microcontrollers.

CO3. utilize the PIC/ARM processor registers, instruction pipeline, interrupts and architecture.

CO4. examine the instructions, addressing modes, conditional instructions and programming of advanced embedded processors and microcontrollers.

CO5. analyze the architectures, instructions, interfacing and applications of Raspberry Pi board.

CO6. elaborate the advanced intel Galileo or Edison microprocessors for embedded systems for IoT.

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माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
A GOVT. AIDED UGC AUTONOMOUS INSTITUTE, AFFILIATED TO R.G.P.V. BHOPAL (M.P.), INDIA
NAAC ACCREDITED WITH A++ GRADE
Centre for Internet of Things

Syllabus
VII Semester

2020-2024

B.Tech.

in

Internet of Things(IoT)

Madhav Institute of Technology & Science
Gwalior-474005

OPTIMIZATION METHODS IN ENGINEERING
230731

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVE

- To provide basic understanding of constraints optimization.
- To understand the fundamental theory and concepts of single and multivariable optimization.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Unit-I

Introduction to optimization: Optimal Problem Formulation, Design Variables, Constraints, Objective Function, Variable Bounds, Engineering Optimization Problems, Classification of Optimization Algorithms.

Unit-II

Single-variable optimization algorithm: Bracketing methods, Region elimination methods; Interval halving method, Fibonacci search method, Point-estimation method; Successive quadratic estimation method. Gradient-based methods: Newton-Raphson method, Bisection method, Secant method.

Unit-III

Multivariable optimization algorithm: Optimality criteria, Unidirectional search, Direct search methods: Evolutionary optimization method, Simplex search method, Hooke-Jeeves pattern search method.

Unit-IV

Constrained optimization algorithm: Kuhn Tucker Condition, Rosen's Gradient projection method, Penalty function method.

Unit-V

Evolutionary optimization algorithms and its applications: Genetic Algorithm, Differential Evolution and Particle Swarm Optimization, Application of optimization techniques in engineering design problems.

RECOMMENDED BOOKS

- S. S. Rao, Engineering Optimization- Theory and Practice, New Age International, 1996.
- Kalyanmoy Deb, Optimization for Engineering Design, Algorithms and Examples, Prentice Hall, 1995.
- Kalyanmoy Deb, Multiobjective Optimization Using Evolutionary Algorithms, Wiley.
- Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms, Samir Roy and Udit Chakraborty, Pearson
- Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa , Wiley Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications- S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI

COURSE OUTCOMES

After completion of the course, students would be able to:

CO1. define the basic of optimization algorithms.

CO2. classify the concept of evolutionary optimization techniques.

CO3. make use of single and multivariable optimization.

CO4. apply the concepts of optimization in engineering design problems.

CO5. compare various evolutionary optimization techniques.

CO6. adapt optimization techniques for real world problems.

Centre for Internet of Things

PATTERN RECOGNITION
230733

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVE

- To analyse the usability of image processing application.
- To choose appropriate ML algorithms for specific application.
- To understand the implementation of python in the real-world application.

Unit-I

Introduction to pattern Recognition: Overview of Pattern Recognition, Applications of Pattern Recognition, Pattern Recognition Techniques, Challenges in Pattern Recognition.

Unit-II

Data Pre-processing Types of Data, Data Acquisition Techniques, Data Pre-processing Techniques, Image Enhancement Techniques, Feature Selection and Extraction Techniques, Feature Scaling and Transformation, Feature Extraction.

Unit-III

Introduction to Deep Learning, Neural Networks and Convolutional Neural Networks, Deep Learning, Transfer Learning, Feature Fusion Techniques, Hyper-parameter Optimization, Ensemble Methods in Pattern Recognition.

Unit-IV

Implementation: Overview of Object Detection and Segmentation, Feature-Based Object Detection, Deep Learning-Based Object Detection, Image Segmentation Techniques.

Unit-V

Application: Introduction to Time Series Analysis, Applications of Time Series Analysis in Real-world application, Time Series Analysis Techniques, Time Series Analysis.

RECOMMENDED BOOKS

- Pattern Recognition and Machine Learning by Christopher Bishop.
- Deep Learning by Ian Goodfellow, Yoshua Bengio Aaron Courville, 2016.
- Deep Learning with Python by Francois Chollet.

COURSE OUTCOMES

After completion of the course, students would be able to:

CO1. explain the basic principle of image processing

CO2. apply the advance pattern recognition algorithms on images

CO3. analyse the potential of basic image processing

CO4. compare different pattern recognition algorithms on different domain

CO5. develop the real world application of pattern recognition

CO6. design basic programming structure for image processing using python

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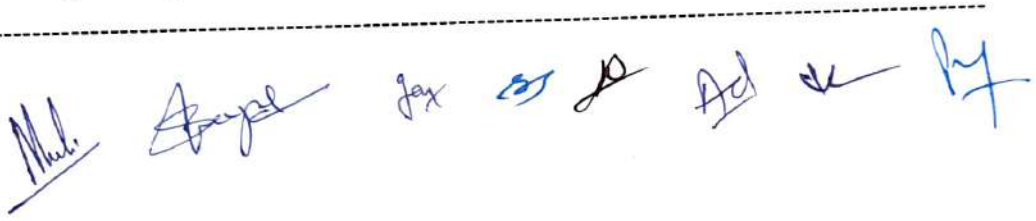

Centre for Internet of Things

SMART GRID (230732)

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To understand the significance of Smart Grid in electrical power system.
- To know basics of WAMS and understanding the concept of Communication Technology for Smart Grid.
- To understand the importance of Distributed Energy Resources

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Unit-I

Introduction to Smart Grid: Evolution of Electric Grid, Concept, Definitions, Need and Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid.

Unit-II

Smart Grid Measurement and Automation: Wide Area Monitoring Systems (WAMS), Phasor Measurement Units (PMU), Smart Meters – Key Components of Smart Metering, Smart Appliances, Advanced Metering Infrastructure (AMI).

Unit-III

Information and Communication Technology for Smart Grid: Classification of Power System Communication according to their functional requirements, Communications Infrastructure and Protocols for Smart Metering, Smart Grid Communication Technologies – Wireless and Wired, Smart Grid Cyber Security.

Unit-IV

Distributed Energy Resources: Sustainable Energy Options for the Smart Grid, Issues Associated with Sustainable Energy Technology, Concept of micro grid, need & applications of micro grid, formation of micro grid, protection & control of micro grid.

Unit-V

IoT in Smart Grid: Smart Meters, Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI), Real Time Pricing, Smart Appliances. Smart sensors: home & building automation, substation automation, plug in hybrid electric-vehicles (PHEV), Electric Vehicles and Plug-in Hybrids, Impact of PHEV on the Grid.

RECOMMENDED BOOKS

- Salman K. Salman, Introduction to the Smart Grid: Concepts, Technologies and Evolution, The Institution of Engineering and Technology (IET).
- Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Smart Grid: Technology and Applications, John Wiley & Sons.
- James Momoh, Smart Grid: Fundamentals of Design and Analysis, John Wiley & Sons, IEEE Press.
- Smart Grids, Infrastructure, Technology and Solutions, S. Borlase, CRC Press, 2013, 1st Edition.
- Renewable and Efficient Electric Power System, G. Masters, Wiley–IEEE Press, 2013, 2nd Edition.
- Ali Keyhani, Design of smart power grid renewable energy systems, Wiley IEEE.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. recognize the concept of smart grid and its advantages over conventional grid.

CO2. assess the role of automation and digitization in Transmission and Distribution.

CO3. learn various sensing technologies, networking and communication technologies involved with the smart grid.

CO4. analyse Smart grids and Distributed energy resources (DER).

CO5. infer the basics of Electric Vehicles.

CO6. recognize applications of IoT in Smart Grid

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D No 218
05/09/2023

BOARD OF STUDIES (BoS) PROCEEDING IN INFORMATION TECHNOLOGY

(Meeting Dated – 02nd June, 2023)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

DEPARTMENT OF INFORMATION TECHNOLOGY

Summary of Board of Studies (BoS)

Courses where revision was carried out

(Course/subject name)	Course Code	Year / Date of introduction	Year / Date of revision	[illegible] Content added or replaced	[illegible]	[illegible]
Discrete Structures	230501/240501	28/05/2022	02/06/2023	12.5%	ITEM IT - 10	06

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DEPARTMENT OF INFORMATION TECHNOLOGY

Summary of Board of Studies (BoS)

Course Focusing on Employability/Entrepreneurship/Skill Development

Course/subject name	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.
Social Network Analysis	160763	This course provides the knowledge how information spreads through society; robustness and fragility of networks; algorithms for the World Wide Web; prediction and recommendation in online social networks; representation learning for large networks; etc.	ITEM IT - 05	03
Big Data Computing	160765	This course provides an in-depth understanding of terminologies and the core concepts behind big data problems, applications, systems and the techniques, that underlie today's big data computing technologies.	ITEM IT - 05	03
Computer Vision	160766	The course provide a comprehensive coverage of theory and computation related to imaging geometry, scene understanding, exposure to clustering, classification and deep learning techniques.	ITEM IT - 05	03
Deep Learning	160764	This course provides the knowledge of traditional Machine Learning approaches, e.g. Bayesian Classification, Multilayer Perceptron etc. and then move to modern Deep Learning architectures like Convolutional Neural Networks, Auto encoders etc. so that student can apply Deep Learning techniques to solve various real life problems.	ITEM IT - 05	03
Robotics System and Control	240504	This subject will give knowledge of robotics system and its control. Students can use subject knowledge to understand the working of small robots. That knowledge is essential for AI and robotics engineers. That will improve skills towards current requirements of companies.	ITEM IT - 09	06
Data Science using Python	160512/240502	This subject will provide skills to the students by understanding exemplary models on various real time applications.	ITEM IT - 09	06
Embedded System & IoT	230504	With embedded systems and IoT students will gain skill of various micro controllers used for IoT boards.	ITEM IT - 09	06

DEPARTMENT OF INFORMATION TECHNOLOGY

Data Sciences in IoT	230502	Analytics in IoT will provide skills to the students by understanding exemplary models on various real time applications.	ITEM IT - 09	06
Soft Computing Techniques	160515/230505/ 240505	As we know that, most of the companies use soft computing algorithm to build AI based projects. So here students can learn and apply subject knowledge of soft computing techniques to analyze real problems and apply that to solve the problems.	ITEM IT - 09	06
Reinforcement Learning	IT0723H1	This course model the trial-and-error learning process that is needed in many problem situations where explicit instructive signals are not available. It has roots in operations research, behavioural psychology and AI.	ITEM IT - 08	04
Design and Thinking Lab	2240325/ 2270326/ 2280326	Students to learn basic prototyping skills needed to develop modules needed for Industry 4.0	ITEM IT - 13	07

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DEPARTMENT OF INFORMATION TECHNOLOGY

Summary of Board of Studies (BoS)

New Courses

(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.
Optimization Methods in Engineering	160731/ 230731	This course is useful to enrich the concepts of optimization and its applications for solving the different engineering design problems. The course provides detailed exposure regarding the conventional and evolutionary optimization techniques. This course finds the application in various engineering domains and may help in developing the interdisciplinary research skills.	ITEM IT - 04	02
Robot Operating System	240731	The ROS (Robot Operating System) course provides a thorough overview of the ROS architecture and principles. It will be useful to understand how to use ROS tools and frameworks to connect sensors, create control algorithms, and simulate robot behaviour.	ITEM IT - 04	02
Smart Grid	230732	This course provides exposure to the topics including grid evolution, Wide Area Monitoring System, renewable sources integration, Energy Storage and IoT applications in smart grid. This course is important as it covers various aspects of new and trending technologies, which are useful in terms of future perspectives in order to enhance the skills and employability.	ITEM IT - 04	02
Humanoid Robotics	240732	This course will assist in developing a thorough grasp of humanoid robot design, components, and functionality. It will aid in the investigation of human-robot interaction strategies, with a particular emphasis on designing intuitive interfaces and behaviours to promote successful communication between humans and humanoid robots.	ITEM IT - 04	02
Pattern Recognition	160732/ 230733/ 240733	The course provide a detailed overview related to feature extraction techniques, representation of patterns in feature space and statistical, nonparametric and neural network techniques for pattern recognition.	ITEM IT - 04	02
Google Cloud Computing Foundations	160762/ 230761	The course provide a detailed overview of concepts covering cloud basics, big data, and machine learning and where and how the Google Cloud Platform fits in.	ITEM IT - 05	03
Statistical Learning For Reliability Analysis	240761	This course provide a wide range of statistical learning approaches related to data sampling, hypothesis testing, statistical inference with both parametric and non-parametric methods, dealing data with one or more population, variance analysis, t-testing, likelihood estimation, etc.	ITEM IT - 05	03

IoT and Its Applications	910203	This course is vital in today's tech-driven world. It enables staying at the forefront of innovation, offers lucrative career opportunities, and ensures competitiveness in the job market as companies actively seek IoT professionals for developing and implementing cutting-edge solutions.	ITEM IT - 06	03
Information Retrieval	270501/ 280501	Basic concepts and techniques of information retrieval for extracting knowledge from the web.	ITEM IT - 10	06

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DEPARTMENT OF INFORMATION TECHNOLOGY

Summary of Board of Studies (BoS)

Feedback on curriculum received from stakeholders: Analysis & ATR

Stakeholder	Student	Faculty	Alumni	Employer
No. of responses	661	16	53	67
Link of Analysis	https://docs.google.com/document/d/1IJgg2GWjPkHJj-Sk6eIYdHwEUO7UhWWk/edit	https://docs.google.com/document/d/1IJgg2GWjPkHJj-Sk6eIYdHwEUO7UhWWk/edit	https://docs.google.com/document/d/1IJgg2GWjPkHJj-Sk6eIYdHwEUO7UhWWk/edit	https://docs.google.com/document/d/1IJgg2GWjPkHJj-Sk6eIYdHwEUO7UhWWk/edit
ATR Link	https://docs.google.com/document/d/1IJgg2GWjPkHJj-Sk6eIYdHwEUO7UhWWk/edit	https://docs.google.com/document/d/1IJgg2GWjPkHJj-Sk6eIYdHwEUO7UhWWk/edit	https://docs.google.com/document/d/1IJgg2GWjPkHJj-Sk6eIYdHwEUO7UhWWk/edit	https://docs.google.com/document/d/1IJgg2GWjPkHJj-Sk6eIYdHwEUO7UhWWk/edit
Link showing Excel sheet of Google Form details of stakeholders	https://drive.google.com/drive/folders/1wmTaDEV1R_KEhH6a7GFUAiGXIQOxBfvJ?usp=share_link	https://docs.google.com/spreadsheets/d/1qlJUbGQ4-Wv1vOcrvJ7IrujzPsm_p6sw/edit?usp=share_link&ouid=103555980183400298166&rtpof=true&sd=true	Alumni FB responses	Employer FB responses

Madhav Institute of Technology & Science, Gwalior-474 005

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Department of Information Technology

Date: 2nd June 2023

Minutes of Meeting of Board of Studies (BoS) in Information Technology

The Meeting of **Board of Studies (BoS)** in **Information Technology** was held on 2nd June, 2023 at 11:30 A.M. onwards **in offline mode / online mode (through video conferencing)**. During the meeting, following were present.

1.	Dr. Akhilesh Tiwari, Professor & Head	Chairman
2.	Dr. Surya Prakash Discipline of Computer Science and Engineering, School of Engineering, Indian Institute of Technology Indore Indore-453552, Madhya Pradesh, India	External Member (Academics) ***(Nominee of Hon'ble Vice Chancellor RGPV Bhopal)***
3.	Dr. Deepak Garg Vice-Chancellor, SR University, Telangana	External Member (Academics)
4.	Dr. Nisha Chaurasia, Assistant Professor, Department of Information Technology, Dr. B. R. Ambedkar National Institute of Technology, Jalandhar (Punjab)	External Member (Alumnus)
5.	Dr. Vivek Tiwari, Department of Computer Science Engineering, International Institute of Information Technology, Naya Raipur (IIIT-NR)	Invitee Member (Academics)
6.	Dr. Sanjiv Sharma, Assistant Professor	Member
7.	Mr. Vikas Sejwar, Assistant Professor	Member
8.	Mr. Abhilash Sonker, Assistant Professor	Member
9.	Ms. Neha Bhardwaj, Assistant Professor	Member
10.	Dr. Saumil Maheshwari, Assistant Professor	Member
11.	Dr. Vikram Rajpoot, Assistant Professor	Member
12.	Dr. Dhananjay Bisen, Assistant Professor	Member
13.	Dr. Tej Singh, Assistant Professor	Member
14.	Dr. Pawan Dubey, Assistant Professor	Member
15.	Dr. Abhishek Dixit, Assistant Professor	Member
16.	Dr. Bhagat Singh Raghuwansi, Assistant Professor	Member
17.	Dr. Nidhi Saxena, Assistant Professor	Member
18.	Mr. Aditya Dubey, Assistant Professor	Member
19.	Dr. Anshika Srivastava, Assistant Professor	Member
20.	Dr. Kritika Bansal, Assistant Professor	Member
21.	Dr. Sunil Kumar Shukla, Assistant Professor	Member
22.	Dr. Vibha Tiwari, Assistant Professor	Member
23.	Dr. Ashish Soni, Assistant Professor	Member
24.	Dr. Nookala Venu, Assistant Professor	Member
25.	Mr. Mir Sahnawaz Ahmad, Assistant Professor	Member
26.	Ms. Shubha Mishra, Assistant Professor	Member

In addition to above, faculty members under contractual engagement were also present.

The following external and internal members could not attend the meeting.

1.	Dr. Dinesh Kumar Vishwakarma, Professor, Department of Information Technology, Delhi Technological University (DTU), Delhi	External Member (Academics)
2.	Mr. Abhinav Mishra, Co-Founder & CEO at Altysys and Former Sr. Director, Persistent System Limited	External Member (Industry)
3.	Dr. Punit Kumar Johari, Assistant Professor	Internal Member
4.	Mr. Rajeev Kumar Singh, Assistant Professor	Internal Member
5.	Dr. Priyanka Garg, Assistant Professor	Internal Member

The following student members/ representatives were also present in the meeting.

1.	Praveen Singh Bhadouriya (0901IO201049)	B. Tech IoT Fourth Year
2.	Ashutosh kewat Manjhi (0901AI201014)	B. Tech AIR Fourth Year
3.	Harsh Sharma (0901IO211023)	B. Tech IoT Third year
4.	Siddhant (0901IO211059)	B. Tech IoT Third year
5.	Ayush Hurkat (0901IT211013)	B. Tech IT Third year
6.	Rahul Lalwani (0901AM211045)	B. Tech AIML Third year
7.	Kanishka Jain (0901AD211023)	B. Tech AIDS Third year

The following deliberation took place in the meeting:

ITEM IT-1:	To confirm the minutes of previous BoS meeting held in the month of December 2022. **The minutes of previous Board of Studies (BoS) meeting held on 14th December 2022 were presented, discussed and confirmed.**
ITEM IT-2:	To prepare and finalize the scheme structure of B. Tech. VII Semester with the provision of *Three Departmental Electives (DEs)* (in which two Departmental Electives to be offered in online mode with credit transfer) *and one Open Category (OC) Course for the batch admitted in 2020-21.* **The Scheme of B. Tech. VII semester [Information Technology, Internet of Things, Information Technology (Artificial Intelligence and Robotics)] (batch admitted 2020-21), were discussed and recommended. The Scheme is annexed as Annexure-I.**
ITEM IT-3:	To prepare and finalize the scheme structure of B. Tech. VIII Semester with the provision of *One Departmental Elective (DE) and one Open Category (OC) Course* (both DE and OC offered in online mode with credit transfer) *for the batch admitted in 2020-21.* **The scheme structure of B. Tech VIII semester [Information Technology, Internet of Things, Information Technology (Artificial Intelligence and Robotics)] (batch admitted 2020-21), were discussed and recommended. The Scheme is annexed as Annexure-II.**
ITEM IT-4:	To prepare and finalize the syllabus of courses to be offered *(for the batch admitted in 2020-21)* under *Departmental Elective (DE) Course* (in traditional mode) for B. Tech. *VII Semester* along with their COs. **The courses to be offered under Departmental Elective (DE-2) category (in offline mode) for B. Tech VII Semester [Information Technology, Internet of Things, Information Technology (Artificial Intelligence and Robotics)] (under flexible curriculum) were discussed and finalized, as per the following detail. The detailed syllabi (along with their COs) is Annexed as Annexure - III.**

	DE-2 (B. Tech IT): • Optimization Methods in Engineering • Pattern Recognition • Mobile Computing **DE-2 (B. Tech IoT):** • Optimization Methods in Engineering • Smart Grid • Pattern Recognition **DE-2 (B. Tech IT(AIR)):** • Robot Operating System • Humanoid Robotics • Pattern Recognition
ITEM **IT-5:**	To propose the list of courses which the students can opt from SWAYAM/NPTEL/MOOC based Platforms, to be offered in *online mode under* Departmental Elective (DE) Courses, with credit transfer in the B. Tech. *VII Semester under* the flexible curriculum *(for the batch admitted in 2020-21).* **The list of Departmental Elective (DE-3 & DE-4) courses to be offered from SWAYAM/NPTEL/MOOC based learning platform (in online mode) for B. Tech VII Semester [Information Technology/Internet of Things/ Information Technology (Artificial Intelligence and Robotics)] (under flexible curriculum) were discussed and finalized, as per the following detail** **DE-3 (B. Tech IT):** • Software Testing (12 Weeks) • Google Cloud Computing Foundations (8 Weeks) • Social Network Analysis (12 Weeks) **DE-4 (B. Tech IT):** • Deep Learning (12 Weeks) • Big Data Computing (8 Weeks) • Computer Vision (12 Weeks) **DE-3 (B. Tech IoT):** • Google Cloud Computing Foundations (8 Weeks) • Computer Graphics (8 Weeks) • Social Network Analysis (12 Weeks) **DE-4 (B. Tech IoT):** • Deep Learning (12 Weeks) • Big Data Computing (8 Weeks) • Computer Vision (12 Weeks) **DE-3 (B. Tech IT(AIR)):** • Statistical Learning For Reliability Analysis (12 Weeks) • Computer Graphics (8 Weeks) • Google Cloud Computing Foundations (8 Weeks) **DE-4 (B. Tech IT(AIR)):** • Deep Learning (12 Weeks) • Social Network Analysis (12 Weeks) • Computer Vision (12 Weeks) ***In continuation, it is also discussed and recommended that the above mentioned list of Departmental Elective (DE) course may be kept dynamic and newly emerging courses may be inducted in line with the industrial need and emerging developments (as and when desired).***
ITEM **IT-6:**	To prepare and finalize the syllabus of courses to be offered *(for the batch admitted in 2020-21)* under the *Open Category (OC) Courses* (in traditional mode) for B. Tech. *VII semester* students of other departments along with their COs. **The courses to be offered under Open Category (OC) Courses for B. Tech VII Semester (for the students of other departments) under flexible curriculum, were discussed and finalized, as per the following detail**

	OC-2: • IoT and Its Applications • Soft Computing • Software Testing ***It is further discussed that the Open Category (OC) courses are meant only for the students of other departments; therefore the above list of courses may be kept dynamic (as per the need and demand from other departments).*** **The detailed syllabi (along with their COs) is annexed as Annexure-IV.**
ITEM IT-7:	To prepare and finalize the Experiment list/ Lab manual for Departmental Laboratory Course (DLC) to be offered in B. Tech. VII semester *(for the batch admitted in 2020-21).* **The experiment list / lab manual for the Laboratory Courses for B. Tech VII semester [Information Technology, Internet of Things, Information Technology (Artificial Intelligence and Robotics)] were discussed and finalized. The same is annexed as Annexure-V.**
ITEM IT-8:	To propose the list of "Additional Courses" which can be opted for getting an *(i) Honours (for students of the host department)* *(ii) Minor Specialization (for students of other departments)* *[These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the* B. Tech. *VII semester students (for the batch admitted in 2020-21)] and for* B. Tech. *V semester (for the batch admitted in 2021-22)]* **The courses available on SWAYAM/NPTEL/MOOC based learning platforms for Honours and Minor Specialization were discussed and identified. The details of courses under Honours Specialization (through SWAYAM/NPTEL portal) has been concluded and summarized under Annexure VI. Further, it was decided that the list of honours specialization will remain dynamic (i.e. can be changed as per the demand/need of stakeholders).** **B. Tech V Semester IT (2021-22 admitted batch)** **Additional Courses for "Minor Specialization" (Other Departments)** • Programming in Java (12 Weeks) • Introduction to Operating Systems (8 Weeks) • Computer Graphics (8 Weeks) **B. Tech V Semester IoT (2021-22 admitted batch)** **Additional Courses for "Minor Specialization" (Other Departments)** • Introduction to Internet of Things (12 Weeks) • Introduction to Operating Systems (8 Weeks) • Computer Graphics (8 Weeks) **B. Tech V Semester IT(AIR) (2021-22 admitted batch)** **Additional Courses for "Minor Specialization" (Other Departments)** • Introduction to Operating Systems (8 Weeks) • Programming, Data Structures and Algorithms in Python (8 Weeks) • Computer Graphics (8 Weeks) **B. Tech V Semester AI&DS (2021-22 admitted batch)** **Additional Courses for "Minor Specialization" (Other Departments)** • Database Management System (8 Weeks)

- Programming, Data Structures and Algorithms in Python (8 Weeks)
- Introduction to Internet of Things (12 Weeks)

B. Tech V Semester AI&ML (2021-22 admitted batch)

Additional Courses for "Minor Specialization" (Other Departments)

- Database Management System (8 Weeks)
- Programming, Data Structures and Algorithms in Python (8 Weeks)
- Introduction to Internet of Things (12 Weeks)

B. Tech VII Semester IT (2020-21 admitted batch)

Additional Courses for "Honours" (Parent Department)

- The Joy of Computing using Python (12 Weeks)
- Reinforcement Learning (12 Weeks)
- Introduction To Haskell Programming (8 Weeks)
- Advanced Distributed Systems (12 Weeks)

Additional Courses for "Minor Specialization" (Other Departments)

- Introduction to Operating Systems (8 Weeks)
- Programming in Java (12 Weeks)
- Programming, Data Structures and Algorithms in Python (8 Weeks)
- Design and analysis of algorithms (8 Weeks)
- Distributed Systems (8 Weeks)
- Introduction To Internet Of Things (12 Weeks)
- Computer Graphics (8 Weeks)

B. Tech VII Semester IoT (2020-21 admitted batch)

Additional Courses for "Honours" (Parent Department)

- Hardware Modeling Using Verilog (8 Weeks)
- Design & Implementation of Human-Computer Interfaces (12 Weeks)
- The Joy of Computing using Python (12 Weeks)
- Introduction To Industry 4.0 And Industrial Internet Of Things (12 Weeks)
- Reinforcement Learning (12 Weeks)
- Advanced Distributed Systems (12 Weeks)
- Introduction To Haskell Programming (8 Weeks)

Additional Courses for "Minor Specialization" (Other Departments)

- Introduction to Internet of Things (12 Weeks)
- Introduction to Operating Systems (8 Weeks)
- Programming, Data Structures and Algorithms in Python (8 Weeks)
- Design and analysis of algorithms (8 Weeks)
- Programming in Modern C++ (12 Weeks)
- Programming in Java (12 Weeks)
- Distributed Systems (8 Weeks)
- Cloud Computing (12 Weeks)

B. Tech VII Semester AIR (2020-21 admitted batch)

Additional Courses for "Honours" (Parent Department)

- Machine Learning for Earth System Sciences (8 Weeks)
- Design & Implementation of Human-Computer Interfaces (12 Weeks)
- The Joy of Computing using Python (12 Weeks)
- Applied Accelerated Artificial Intelligence (12 Weeks)
- Advanced Distributed Systems (12 Weeks)

	• Introduction To Haskell Programming (8 Weeks) **Additional Courses for "Minor Specialization" (Other Departments)** • Introduction to Operating Systems (8 Weeks) • Design and analysis of algorithms (8 Weeks) • Programming, Data Structures and Algorithms in Python (8 Weeks) • Artificial Intelligence: Search Methods For Problem Solving (12 Weeks) • Distributed Systems (8 Weeks) • Cloud Computing (12 Weeks)
ITEM **IT-9:**	To prepare and recommend the *scheme structure of B. Tech. V Semester under* the flexible curriculum (for the *Batch admitted in 2021-22).* **The Scheme of B. Tech. V semester [Information Technology, Internet of Things (IoT), Information Technology (Artificial Intelligence and Robotics), Artificial Intelligence and Data Science, Artificial Intelligence and Machine Learning] (batch admitted 2021-22), were discussed and recommended. The Scheme is annexed as Annexure-VII.**
ITEM **IT-10:**	To prepare and recommend the syllabi for all *Departmental Core (DC) Courses* of B. Tech. *V Semester (for the b*atch admitted in 2021-22) under the flexible curriculum along with their COs. ***The Syllabi (along with the Course Outcomes) of B. Tech. V* [Information Technology, Internet of Things (IoT), Information Technology (Artificial Intelligence and Robotics), Artificial Intelligence and Data Science, Artificial Intelligence and Machine Learning] (*batch admitted 2021-22), were discussed and finalized.* The same is annexed as Annexure- VIII.**
ITEM **IT-11:**	To prepare and recommend the suggestive Experiment list/ Lab manual and list of projects which can be assigned under the 'Skill based mini-project' category in various laboratory component based courses to be offered in B. Tech. V Semester *(for the batch admitted in 2021-22).* **The experiment list / lab manual and list of projects for the laboratory courses for B. Tech V semester [Information Technology, Internet of Things (IoT), Information Technology (Artificial Intelligence and Robotics), Artificial Intelligence and Data Science, Artificial Intelligence and Machine Learning] were discussed and finalized. The same is annexed as Annexure-IX.**
ITEM **IT-12:**	To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered *(for the batch admitted in 2021-22)* in online mode under *Self-Learning/ Presentation*, in the B. Tech. *V Semester.* **The courses to be offered under Self-Learning/ Presentation through SWAYAM / NPTEL based learning platform for B. Tech. V semester (2021-22 admitted batch) [Information Technology, Internet of Things (IoT), Information Technology (Artificial Intelligence and Robotics), Artificial Intelligence and Data Science, Artificial Intelligence and Machine Learning], under flexible curriculum were discussed and finalized, as per the following** **B. Tech. V Semester** • Python for Data Science (4 Week) • Demystifying networking (4 Week)

	To promote the self-learning, it is mandatory to register for one online course (as per above list) from the SWAYAM / NPTEL platform under the Seminar / Self Study Course. Further, the evaluation will be based on attendance, assignments and presentations, etc
ITEM **IT-13:**	To review, prepare, finalize and recommend the *Scheme & Syllabi (along with the Course Outcomes) of III semester* B. Tech. programmes (for the batch admitted 2022-23 Session) **The Scheme & Syllabi *(along with the Course Outcomes)* of B. Tech. programmes [Information Technology, Internet of Things (IoT), Information Technology (Artificial Intelligence and Robotics), Artificial Intelligence and Data Science, Artificial Intelligence and Machine Learning] III semester (*batch admitted 2022-23*) were discussed and finalized. The scheme & detailed syllabi is annexed as Annexure-X.**
ITEM **IT-14:**	To review, prepare, finalize and recommend the list of experiments/ Lab manual and skill based mini projects for various laboratory courses to be offered in III Semester *(for the batch admitted in 2022-23).* **The experiment list / lab manual and skill based mini project for the Laboratory Courses for B. Tech III semester [Information Technology, Internet of Things (IoT), Information Technology (Artificial Intelligence and Robotics), Artificial Intelligence and Data Science, Artificial Intelligence and Machine Learning] were discussed and finalized. The same is annexed as Annexure-XI.** *The list of "skill based mini project" for the Laboratory Courses must be treated as dynamic and more projects can be added by the course faculty.*
ITEM **IT-15:**	To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered *(for the batch admitted in 2022-23)* in online mode under *Self-Learning/ Presentation*, in the *III Semester*. **The courses to be offered under Self-Learning/ Presentation through SWAYAM / NPTEL based learning platform for B. Tech. III semester (2022-23 admitted batch) [Information Technology, Internet of Things (IoT), Information Technology (Artificial Intelligence and Robotics), Artificial Intelligence and Data Science, Artificial Intelligence and Machine Learning], under flexible curriculum were discussed and finalized, as per the following** **B. Tech. III Semester** • Programming, Data Structures And Algorithms Using Python (8 Week) • Getting Started with Competitive Programming (12 Week) ***To promote the self learning, it is mandatory to register for one online course (as per above list) from the SWAYAM / NPTEL platform under the Seminar / Self Study Course. Further, the evaluation will be based on attendance, assignments and presentations, etc.***
ITEM **IT-16:**	**To review, prepare and recommend the scheme structure,** Syllabi (along with the Course Outcomes), list of experiments/ Lab manual and skill based mini projects for various laboratory courses **of *I & II semester* B. Tech. programmes (for the batch admitted in 2023-24 Session)** **The Scheme, Syllabi *(along with the Course Outcomes),* list of experiments/ Lab manual and skill based mini projects of B. Tech. programmes [Information Technology, Internet of Things (IoT), Information Technology (Artificial Intelligence and Robotics), Artificial Intelligence and Data Science, Artificial Intelligence and**

	Machine Learning] III semester (*batch admitted 2022-23*) were discussed and finalized. The same is annexed as Annexure-XII.
ITEM **IT-17:**	To review the CO attainments, to identify gaps and to suggest corrective measures for the improvement in the CO attainment levels for July-Dec 2022. **The attainment levels of Course Outcomes (COs) for all the courses pertaining to July-December 2022 semester were presented and reviewed. The house appreciated the same and observed the achievement of target attainment levels for almost all the courses. The same is enclosed as Annexure-XIII.**
ITEM **IT-18:**	To review PO attainment of 2018-2022 batch, CO-PO mapping matrix with attainments and gap analysis. **The Programme Outcome (PO) attainment, CO-PO mapping matrix with attainments and gap analysis for 2018-2022 passout batch were discussed and reviewed. The same is annexed as Annexure-XIV.**
ITEM **IT-19:**	To review curricula feedback from various stakeholders, its analysis and impact. **The summarized report of curricula feedback from various stakeholders (students, faculty members and alumni etc.) (Nov. 2022 to March 2023 (I Semester)) was presented and discussed. This was based on various considered parameters. Further, the house has reviewed the feedback & its summarized report and efforts made where appreciated. The report is annexed as Annexure-XV.**
ITEM **IT-20:**	To review the Course Outcomes (COs) feedback of various courses, its analysis, and ATR (for July –Dec. 2022 semester) **The detailed analysis and impact report of Course Outcomes (COs) feedback of various courses from students [for Jul- Dec 2022 (II & III Year)] was presented and discussed. The same is enclosed as Annexure –XVI.**
ITEM **IT-21:**	To discuss and recommend the scheme structure & syllabi of PG Programme (M. Tech.) along with their Course Outcomes (COs). **The existing Scheme/curriculum of M. Tech. [Information Technology] was reviewed and there is no change in the same.**

Suggestions by External Experts / Members:

- It was suggested to include some content related to robot memory in the course of Humanoid Robotics for the AI and Robotics programme under Departmental Elective courses.

The meeting ended with the vote of thanks to all the members.

Ms. Bulbul Agrawal	Ms. Shubha Mishra	Mr. Mir Shahnawaz Ahmad	Dr. Nookala Venu
Dr. Ashish Soni	Dr. Vibha Tiwari	Dr. Sunil Kumar Shukla	Dr. Kritika Bansal
Dr. Anshika Srivastava	Mr. Aditya Dubey	Dr. Nidhi Saxena	Dr. Bhagat Singh Raghuwansi

Dr. Abhishek Dixit

Dr. Pawan Dubey

Dr. Tej Singh

Dr. Dhananjay Bisen

Dr. Vikram Rajpoot

Dr. Saumil Maheshwari

Ms. Neha Bhardwaj

Mr. Abhilash Sonkar

Mr. Vikas Sejwar

Dr. Sanjiv Sharma

ABSENT

Mr. Abhinav Mishra
Co-Founder & CEO at Altysys and Former Sr. Director, Persistent System Limited

Attended online

Dr. Nisha Chaurasia
Assistant Professor,
Department of Information Technology, Dr. B. R. Ambedkar National Institute of Technology,
Jalandhar (Punjab)

Attended online

Dr. Vivek Tiwari
Assistant Professor,
Department of Computer Science Engineering,
International Institute of Information Technology,
Naya Raipur (IIIT-NR)

Absent

Dr. Dinesh Kumar Vishwakarma
Professor,
Department of Information Technology,
Delhi Technological University (DTU), Delhi

Attended online

Dr. Deepak Garg
Vice-Chancellor,
SR University, Telangana

Attended online.

Dr. Surya Prakash
Professor,
Discipline of Computer Science and Engineering, School of Engineering,
Indian Institute of Technology Indore

02-06-23

(Dr. Akhilesh Tiwari)
Professor & Head,
Department of IT,
MITS Gwalior
[Chairman, BoS]

03/06/2023

DEAN (ACADEMICS)
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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - I

Scheme
of
B. Tech VII Semester
(Batch Admitted in 2020-21)
(Information Technology/Internet of Things(IoT)/ Information Technology (Artificial Intelligence and Robotics))
Under Flexible Curriculum

[ITEM IT -2]

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. VII Semester (IT)

(for batch admitted in academic session 2020 – 21)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs								
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective (DE-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP
2.	DE	DE	Departmental Elective* (DE-3)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
3.	DE	DE	Departmental Elective* (DE-4)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
4.	OC	OC	Open Category (OC-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP
5.	160711	DLC	Departmental Lab (IoT)	-	-	-	-	60	20	20	-	-	100	-	-	4	2	Offline	SO
6.	160712	DLC	Creative Problem Solving (Evaluation)	-	-	-	-	25	25	-	-	-	50	-	-	2	1	Offline	SO
7.	160713	DLC	Summer Internship Project-III (04 weeks) (Evaluation)	-	-	-	-	60	-	-	-	-	60	-	-	4	2	Interactive	SO
Total				**100**	**20**	**40**	**40**	**145**	**45**	**20**	**50**	**150**	**610**	**12**	**-**	**10**	[redacted]		
8.	1000008	MAC	Universal Human Values & Professional Ethics(UHVPE)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	12	05	-	06	-	06	05	-	17
00	-	70.58%	29.42%	-	35.29%	-	35.29%	29.42%	-	Credits %

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

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DE -2		
S. No.	**Subject Code**	**Subject Name**
1.	160731	Optimization Methods in Engineering
2.	160732	Pattern Recognition
3.	160733	Mobile Computing
OC-2		
S. No.	**Subject Code**	**Subject Name**
1.	910203	IoT and Its Applications
2.	910204	Software Testing

DE-3*		
S. No.	**Subject Code**	**Subject Name**
1.	160761	Software Testing (12 Weeks)
2.	160762	Google Cloud Computing Foundations (8 Weeks)
3.	160763	Social Network Analysis (12 Weeks)
DE-4*		
S. No.	**Subject Code**	**Subject Name**
1.	160764	Deep Learning (12 Weeks)
2.	160765	Big Data Computing (8 Weeks)
3.	160766	Computer Vision (12 Weeks)

List of courses to be opted for Honours or Minor specialization in VII Semester

Honours* *(to be opted by students of Parent Department)*		**Minor specialization *** *(to be opted by students of Other Department)*	
Course Code	**Course Name**	**Course Code**	**Course Name**
IT0623H3	The Joy of Computing using Python (12 Weeks)	IT0520M1	Introduction to Operating Systems (8 Weeks)
IT0723H1	Reinforcement Learning (12 Weeks)	IT0521M2	Programming in Java (12 Weeks)
IT0723H2	Introduction To Haskell Programming (8 Weeks)	IT0620M2	Programming, Data Structures and Algorithms Using Python (8 Weeks)
IT0723H3	Advanced Distributed Systems (12 Weeks)	IT0621M1	Design and analysis of algorithms (8 Weeks)
		IT0723M1	Distributed Systems (8 Weeks)
		IT0723M2	Introduction To Internet Of Things (12 Weeks)
		IT0723M3	Computer Graphics (8 Weeks)

* **Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

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Department of Information Technology

Scheme of Evaluation

B. Tech. Internet of Things (IoT) VII Semester *(for batch admitted in academic session 2020 – 21)*

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs								
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective (DE-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP
2.	DE	DE	Departmental Elective (DE-3)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
3.	DE	DE	Departmental Elective (DE-4)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
4.	OC	OC	Open Category (OC-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP
5.	230701	DLC	Departmental Lab	-	-	-	-	60	20	20	-	-	100	-	-	4	2	Offline	SO
6.	230702	DLC	Creative Problem Solving (Evaluation)	-	-	-	-	25	25	-	-	-	50	-	-	2	1	Offline	SO
7.	230703	DLC	Summer Internship Project-III (04 weeks) (Evaluation)	-	-	-	-	60	-	-	-	-	60	-	-	4	2	Interactive	SO
Total				**100**	**20**	**40**	**40**	**145**	**45**	**20**	**50**	**150**	**610**	**12**	**-**	**10**		**-**	**-**
8.	1000008	MAC	Universal Human Values & Professional Ethics(UHVPE)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	12	05	-	06	-	06	05	-	17
00	-	70.58%	29.42%	-	35.29%	-	35.29%	29.42%	-	Credits %

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

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DE -2		
S. No.	**Subject Code**	**Subject Name**
1.	230731	Optimization Methods in Engineering
2.	230732	Smart Grid
3.	230733	Pattern Recognition
OC-2		
S. No.	**Subject Code**	**Subject Name**
1.	910203	IoT and Its Applications
2.	910204	Software Testing

DE-3*		
S. No.	**Subject Code**	**Subject Name**
1.	230761	Google Cloud Computing Foundations (8 Weeks)
2.	230762	Computer Graphics (8 Weeks)
3.	230763	Social Network Analysis (12 Weeks)
DE-4*		
S. No.	**Subject Code**	**Subject Name**
1.	230764	Deep Learning (12 Weeks)
2.	230765	Big Data Computing (8 Weeks)
3.	230766	Computer Vision (12 Weeks)

List of courses to be opted for Honours or Minor specialization in VII Semester

Honours* *(to be opted by students of Parent Department)*		**Minor specialization *** *(to be opted by students of Other Department)*	
Course Code	**Course Name**	**Course Code**	**Course Name**
IO0522H1	Hardware Modeling Using Verilog (8 Weeks)	IO0522M1	Introduction to Internet of Things (12 Weeks)
IO0522H2	Design & Implementation of Human-Computer Interfaces (12 Weeks)	IO0522M2	Introduction to Operating Systems (8 Weeks)
IO0522H3	The Joy of Computing using Python (12 Weeks)	IO0522M3	Programming, Data Structures and Algorithms Using Python (8 Weeks)
IO0623H1	Introduction To Industry 4.0 And Industrial Internet Of Things (12 Weeks)	IO0623M2	Design and analysis of algorithms (8 Weeks)
IO0723H1	Reinforcement Learning (12 Weeks)	IO0623M3	Programming in Modern C++ (12 Weeks)
IO0723H2	Advanced Distributed Systems (12 Weeks)	IO0723M1	Programming in Java (12 Weeks)
IO0723H3	Introduction To Haskell Programming (8 Weeks)	IO0723M2	Distributed Systems (8 Weeks)
		IO0723M3	Cloud Computing (12 Weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

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Department of Information Technology

Scheme of Evaluation

B. Tech. in Information Technology (Artificial Intelligence and Robotics)

VII Semester

(for batch admitted in academic session 2020 – 21

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs								
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P			
				End Sem. Exam.	*Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective (DE-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP
2.	DE	DE	Departmental Elective* (DE-3)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
3.	DE	DE	Departmental Elective* (DE-4)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
4.	OC	OC	Open Category (OC-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP
5.	240701	DLC	Departmental Lab	-	-	-	-	60	20	20	-	-	100	-	-	4	2	Offline	SO
6.	240702	DLC	Creative Problem Solving (Evaluation)	-	-	-	-	25	25	-	-	-	50	-	-	2	1	Offline	SO
7.	240703	DLC	Summer Internship Project-III (04 weeks) (Evaluation)	-	-	-	-	60	-	-	-	-	60	-	-	4	2	Interactive	SO
Total				100	20	40	40	145	45	20	50	150	610	12	-	10			
8.	1000008	MAC	Universal Human Values & Professional Ethics(UHVPE)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization															

* proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	12	05	-	06	-	06	05	-	17
00	-	70.58%	29.42%	-	35.29%	-	35.29%	29.42%	-	Credits %

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

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DE -2		
S. No.	**Subject Code**	**Subject Name**
1.	240731	Robot Operating System
2.	240732	Humanoid Robotics
3.	240733	Pattern Recognition

OC-2		
S. No.	**Subject Code**	**Subject Name**
1.	910203	IoT and Its Applications
2.	910204	Software Testing

DE-3*		
S. No.	**Subject Code**	**Subject Name**
1.	240761	Statistical Learning For Reliability Analysis (12 Weeks)
2.	240762	Computer Graphics (8 Weeks)
3.	240763	Google Cloud Computing Foundations (8 Weeks)

DE-4*		
S. No.	**Subject Code**	**Subject Name**
1.	240764	Deep Learning (12 Weeks)
2.	240765	Social Network Analysis (12 Weeks)
3.	240766	Computer Vision (12 Weeks)

List of courses to be opted for Honours or Minor specialization in VII Semester

Honours* *(to be opted by students of Parent Department)*		**Minor specialization *** *(to be opted by students of Other Department)*	
Course Code	**Course Name**	**Course Code**	**Course Name**
AI0522H1	Machine Learning for Earth System Sciences (8 Weeks)	AI0522M2	Introduction to Operating Systems (8 Weeks)
AI0522H2	Design & Implementation of Human-Computer Interfaces (12 Weeks)	AI0623M3	Design and analysis of algorithms (8 Weeks)
AI0522H3	The Joy of Computing using Python (12 Weeks)	AI0623M1	Programming, Data Structures and Algorithms in Python (8 Weeks)
AI0723H1	Applied Accelerated Artificial Intelligence (12 Weeks)	AI0723M1	Artificial Intelligence: Search Methods For Problem Solving (12 Weeks)
AI0723H2	Advanced Distributed Systems (12 Weeks)	AI0723M2	Distributed Systems (8 Weeks)
AI0723H3	Introduction To Haskell Programming (8 Weeks)	AI0723M3	Cloud Computing (12 Weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - II

Scheme
of
B. Tech VIII Semester
(Batch Admitted in 2020-21)
(Information Technology/Internet of Things(IoT)/ Information Technology (Artificial Intelligence and Robotics))
Under Flexible Curriculum

[ITEM IT -3]

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. VIII Semester (IT)

(for batch admitted in academic session 2020 – 21)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs								
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective* (DE-5)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
2.	OC	OC	Open Category* (OC-3)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
3.	DLC	DLC	Internship/Research Project/ Innovation & Start-up**	-	-	-	-	250	150	-	-	-	400	-	-	18	9	Blended	SO
4.		-	Professional Development	-	-	-	-	50	-	-	-	-	50	-	-	4	2	Interactive	SO
Total				-	-	-	-	300	150	-	50	150	650	6	-	22		-	-
Additional Course for Honours or minor Specialization				Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization															

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

*All of these courses will run through SWAYAM/NPTEL/ MOOC with credit transfer

"Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.)

** Only for those students who have opted relevant Novel Engaging Courses (NEC): Innovation: From Creativity to Entrepreneurship (Part 1-Idea Generation), Innovation: From Creativity to Entrepreneurship (Part 2-Technology, Science, Innovation, and Society), Introduction to Entrepreneurship: Challenges and Opportunities, and Start-up: How to start, survey, Financial, Legal, Pitching and Funding

Mode of Teaching					Mode of Examination					Total Credits
Theory		Blended	Lab	PD	Theory			Lab	NEC	
Offline	Online		Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	06	09	02	-	-	06	09	02	17
-	-	35.29%	52.95%	11.76%	-	-	35.29%	52.95%	11.76%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. Internet of Things (IoT) VIII Semester *(for batch admitted in academic session 2020 – 21)*

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs			L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assign ment	Exam							
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assign ment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective* (DE-5)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
2.	OC	OC	Open Category* (OC-3)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
3.	DLC	DLC	Internship/Research Project/ Innovation & Start-up***	-	-	-	-	250	150	-	-	-	400	-	-	18	9	Blended	SO
4.			Professional Development	-	-	-	-	50	-	-	-	-	50	-	-	4	2	Interactive	SO
Total				-	-	-	-	300	150	-	50	150	650	6	-	22		-	-
Additional Course for Honours or minor Specialization				Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization															

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

*All of these courses will run through SWAYAM/NPTEL/ MOOC with credit transfer

$Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.)

*** Only those students who [illegible] Novel Engaging Courses (NEC): Innovation: From Creativity to Entrepreneurship (Part 1-Idea Generation), Innovation: From Creativity to Entrepreneurship (Part 2-Technology, Science, Innovation, and Society). Introduction to Entrepreneurship: Challenges and Opportunities, and Start-up: How to start, survey, Financial, Legal, Pitching and Funding

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	PD	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	06	09	02	-	-	06	09	02	17
-	-	35.29%	52.95%	11.76%	-	-	35.29%	52.95%	11.76%	Credits %

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Department of Information Technology

Scheme of Evaluation

B. Tech. in Information Technology (Artificial Intelligence and Robotics)

VIII Semester

(for batch admitted in academic session 2020 – 21

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot			MOOCs			L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam							
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective* (DE-5)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
2.	OC	OC	Open Category* (OC-3)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Blended	MCQ
3.	DLC	DLC	Internship/Research Project/ Innovation & Start-up***	-	-	-	-	250	150	-	-	-	400	-	-	18	9	Blended	SO
4.		-	Professional Development	-	-	-	-	50	-	-	-	-	50	-	-	4	2	Interactive	SO
Total				-	-	-	-	300	150	-	50	150	650	6	-	22		-	-
Additional Course for Honours or minor Specialization			Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization																

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

*All of these courses will run through SWAYAM/NPTEL/ MOOC with credit transfer

$Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.)

*** Only for the students who have opted relevant Novel Engaging Courses (NEC): Innovation: From Creativity to Entrepreneurship (Part 1-Idea Generation), Innovation: From Creativity to Entrepreneurship (Part 2-Technology, Science, Innovation, and Society), Introduction to Entrepreneurship: Challenges and Opportunities, and Start-up: How to start, survey, Financial, Legal, Pitching and Funding

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	PD	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	06	09	02	-	-	06	09	02	17
-	-	35.29%	52.95%	11.76%	-	-	35.29%	52.95%	11.76%	Credits %

DEAN (ACADEMICS)
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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - III

Syllabi of Departmental Elective (DE) Courses B.Tech VII Semester (Batch Admitted in 2020-21) (Information Technology/ Internet of Things (IoT)/ Information Technology (Artificial Intelligence and Robotics))

[ITEM IT-4]

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF INFORMATION TECHNOLOGY

OPTIMIZATION METHODS IN ENGINEERING
160731/230731

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVE

- To provide basic understanding of constraints optimization.
- To understand the fundamental theory and concepts of single and multivariable optimization.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Unit-I

Introduction to optimization: Optimal Problem Formulation, Design Variables, Constraints, Objective Function. Variable Bounds, Engineering Optimization Problems, Classification of Optimization Algorithms.

Unit-II

Single-variable optimization algorithm: Bracketing methods, Region elimination methods: Interval halving method, Fibonacci search method, Point-estimation method; Successive quadratic estimation method. Gradient-based methods: Newton-Raphson method, Bisection method, Secant method.

Unit-III

Multivariable optimization algorithm: Optimality criteria, Unidirectional search. Direct search methods: Evolutionary optimization method, Simplex search method, Hooke-Jeeves pattern search method.

Unit-IV

Constrained optimization algorithm: Kuhn Tucker Condition, Rosen's Gradient projection method, Penalty function method.

Unit-V

Evolutionary optimization algorithms and its applications: Genetic Algorithm, Differential Evolution and Particle Swarm Optimization, Application of optimization techniques in engineering design problems.

RECOMMENDED BOOKS

- S. S. Rao, Engineering Optimization- Theory and Practice, New Age International, 1996.
- Kalyanmoy Deb, Optimization for Engineering Design, Algorithms and Examples, Prentice Hall, 1995.
- Kalyanmoy Deb, Multiobjective Optimization Using Evolutionary Algorithms, Wiley.
- Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms, Samir Roy and Udit Chakraborty, Pearson
- Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa , Wiley Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications- S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI

COURSE OUTCOMES

After completion of the course, students would be able to:

CO1. define the basic of optimization algorithms.

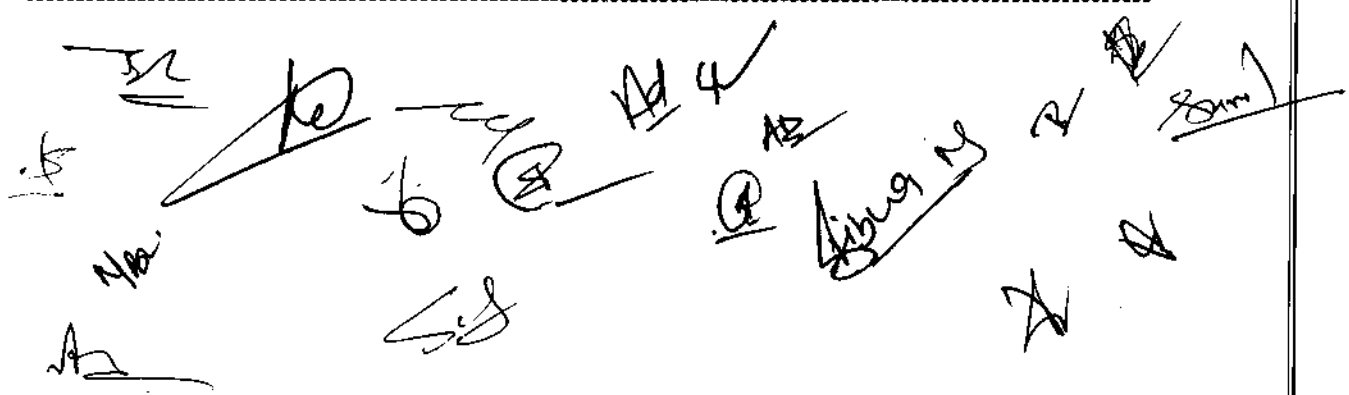
CO2. classify the concept of evolutionary optimization techniques.

CO3. make use of single and multivariable optimization.

CO4. apply the concepts of optimization in engineering design problems.

CO5. compare various evolutionary optimization techniques.

CO6. adapt optimization techniques for real world problems.



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DEPARTMENT OF INFORMATION TECHNOLOGY

PATTERN RECOGNITION
160732/230733/240733

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVE

- To analyse the usability of image processing application.
- To choose appropriate ML algorithms for specific application.
- To understand the implementation of python in the real-world application.

Unit-I

Introduction to pattern Recognition: Overview of Pattern Recognition, Applications of Pattern Recognition, Pattern Recognition Techniques, Challenges in Pattern Recognition.

Unit-II

Data Pre-processing Types of Data, Data Acquisition Techniques, Data Pre-processing Techniques, Image Enhancement Techniques, Feature Selection and Extraction Techniques, Feature Scaling and Transformation, Feature Extraction.

Unit-III

Introduction to Deep Learning, Neural Networks and Convolutional Neural Networks, Deep Learning, Transfer Learning, Feature Fusion Techniques, Hyper-parameter Optimization, Ensemble Methods in Pattern Recognition.

Unit-IV

Implementation: Overview of Object Detection and Segmentation, Feature-Based Object Detection, Deep Learning-Based Object Detection, Image Segmentation Techniques.

Unit-V

Application: Introduction to Time Series Analysis, Applications of Time Series Analysis in Real-world application, Time Series Analysis Techniques, Time Series Analysis.

RECOMMENDED BOOKS

- Pattern Recognition and Machine Learning by Christopher Bishop.
- Deep Learning by Ian Goodfellow, Yoshua Bengio Aaron Courville, 2016.
- Deep Learning with Python by Francois Chollet.

COURSE OUTCOMES

After completion of the course, students would be able to:

CO1. explain the basic principle of image processing

CO2. apply the advance pattern recognition algorithms on images

CO3. analyse the potential of basic image processing

CO4. compare different pattern recognition algorithms on different domain

CO5. develop the real world application of pattern recognition

CO6. design basic programming structure for image processing using python

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DEPARTMENT OF INFORMATION TECHNOLOGY

MOBILE COMPUTING
160733

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To introduce the basic concepts and principles in mobile computing.
- To provide a computer systems perspective on the converging areas of wireless networking, mobile devices, and network protocols.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.

Unit-I

Review of Personal Communication Services (PCS): Basic Concepts of Cellular Systems, Global System for Mobile Communication (GSM), Protocols, Handover, Data Services, and Multiple Division Techniques.

Unit-II

General Packet Radio Services (GPRS): GPRS Architecture. GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 Standard, Mobile IP.

Unit-III

Wireless Application Protocol (WAP): Mobile Internet Standard. WAP Gateway and Protocols, Wireless Markup Languages (WML).

Unit-IV

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) Vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of Services in 3G.

Unit-V

Wireless Local Loop (WLL): Introduction to WLL Architecture. WLL Technologies. Global Mobile Satellite Systems: Case Studies of IRIDIUM and GLOBALSTAR Systems. Bluetooth Technology, Wi-Fi and Wi-Max.

RECOMMENDED BOOKS

- Mobile communications, J. Schiller, Pearson Education.
- Wireless and Mobile Networks Architecture, by Yi —Bing Lin, John Wiley & Sons. Mobile & Personnel Communication Systems and Services, Raj Pandya, Prentice Hall India.
- Wireless Communication- Priciples and Practices, Theodore S. Rappaport, Pearson Education.
- The Wireless Application Protocol, Singhal & Bridgman, Pearson Education.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain the basic concepts of mobile telecommunications system.

CO2. demonstrate the infrastructure to develop mobile communications system.

CO3. classify the different generations and technology for mobile communications.

CO4. examine the working of different protocols of wireless mobile communication technology.

CO5. determine the importance of each technology suitable for different situation of mobile and wireless communications.

CO6. develop protocols for adhoc and infrastructure based wireless networks.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SMART GRID
230732

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To understand the significance of Smart Grid in electrical power system.
- To know basics of WAMS and understanding the concept of Communication Technology for Smart Grid.
- To understand the importance of Distributed Energy Resources

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Unit-I

Introduction to Smart Grid: Evolution of Electric Grid, Concept, Definitions, Need and Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid.

Unit-II

Smart Grid Measurement and Automation: Wide Area Monitoring Systems (WAMS), Phasor Measurement Units (PMU), Smart Meters – Key Components of Smart Metering, Smart Appliances, Advanced Metering Infrastructure (AMI).

Unit-III

Information and Communication Technology for Smart Grid: Classification of Power System Communication according to their functional requirements. Communications Infrastructure and Protocols for Smart Metering, Smart Grid Communication Technologies – Wireless and Wired, Smart Grid Cyber Security.

Unit-IV

Distributed Energy Resources: Sustainable Energy Options for the Smart Grid. Issues Associated with Sustainable Energy Technology, Concept of micro grid, need & applications of micro grid, formation of micro grid, protection & control of micro grid.

Unit-V

IoT in Smart Grid: Smart Meters, Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI), Real Time Pricing, Smart Appliances. Smart sensors: home & building automation, substation automation, plug in hybrid electric-vehicles (PHEV), Electric Vehicles and Plug-in Hybrids, Impact of PHEV on the Grid.

RECOMMENDED BOOKS

- Salman K. Salman, Introduction to the Smart Grid: Concepts, Technologies and Evolution, The Institution of Engineering and Technology (IET).
- Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Smart Grid: Technology and Applications, John Wiley & Sons.
- James Momoh, Smart Grid: Fundamentals of Design and Analysis, John Wiley & Sons, IEEE Press.
- Smart Grids, Infrastructure, Technology and Solutions, S. Borlase, CRC Press, 2013, 1st Edition.
- Renewable and Efficient Electric Power System, G. Masters, Wiley–IEEE Press, 2013, 2nd Edition.
- Ali Keyhani, Design of smart power grid renewable energy systems, Wiley IEEE.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. recognize the concept of smart grid and its advantages over conventional grid.

CO2. assess the role of automation and digitization in Transmission and Distribution.

CO3. learn various sensing technologies, networking and communication technologies involved with the smart grid.

CO4. analyse Smart grids and Distributed energy resources (DER).

CO5. infer the basics of Electric Vehicles.

CO6. recognize applications of IoT in Smart Grid

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DEPARTMENT OF INFORMATION TECHNOLOGY

ROBOT OPERATING SYSTEM
240731

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- Use ROS to inspect and debug a robotics system.
- Prototype simple command and control applications for a simulated mobile robot.
- Integrate a new sensor into the robot's ROS ecosystem.
- Make use of sensor data to inform a robot's mission in real-time.

Unit-I

ROS Fundamentals: Introduction of Linux/UBUNTU, installation and use of virtual box machine, Linux file system and terminal, various commands, Remote Desktop access commands such as SSID, and use of Compiler/IDE in Linux, OOPs concepts with Linux terminal: C++ and Python in Ubuntu Linux, Introduction to Python Interpreter, review of fundamental of python such as functions, class.

Unit-II

ROS architecture and philosophy, installation, ROS master, nodes, and topics, Console commands, Catkin workspace and build system, Launch-files, Gazebo simulator, Programming Tools, ROS package structure, Integration and programming.

Unit-III

ROS C++ client library (roscpp), ROS subscribers and publishers, ROS parameter server, TF Transformation System, rqt User Interface, Robot models (URDF), Simulation descriptions (SDF).

Unit- IV

ROS services, ROS actions (actionlib), ROS time, ROS bags, debugging strategies. Introduction to ROS2, architecture & philosophy, master, nodes, and topics. Console commands, Catkin workspace and build system

Unit -V

ROS services, ROS actions (actionlib), ROS time, ROS bags, Debugging strategies. Introduction to ROS2. Case study: Using ROS in complex real-world applications such as ROS/Gazebo for Maritime Robotics, Home Robotics, UAVs.

RECOMMENDED BOOKS

- Robot Operating System for Absolute Beginners: Robotics Programming Made Easy.
- "Programming Robots with ROS" by Quigley, Gerkey and Smart.
- "The Linux Command Line" by William Shotts.
- "It-Yourself Guide to the Robot Operating System: Volumes" by Patrick Goebel.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. identify the fundamentals of operating system dedicated to Robots.

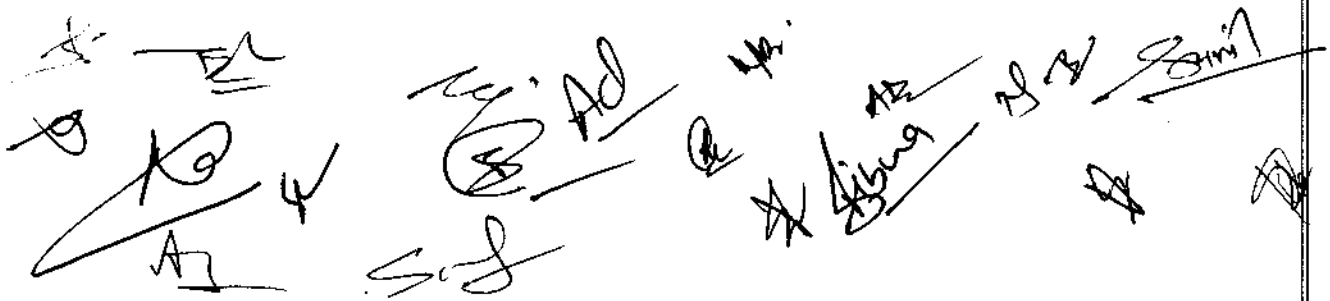
CO2. interpret various case studies of ROS application.

CO3. apply spatial transformation to obtain forward and inverse kinematics through programming.

CO4. determine the robot dynamics problems for path planning and Programming.

CO5. assess working principle of various ROS debugging process.

CO6. develop applications of robots in industry.



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DEPARTMENT OF INFORMATION TECHNOLOGY

HUMANOID ROBOTICS
240732

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To understand and describe the state of the art of humanoid robot.
- To introduce students with mechanism and design of humanoid robot.
- To elucidate the technical challenges with humanoid robot.
- To discuss the potential roles of humanoid robots in society, w.r.t. social and ethical aspects, and applications.

Unit-I

Research on Humanoid Robot, Overview of ASIMO and its significance in humanoid robot research, Anatomy and structure of ASIMO, Design considerations for stability, mobility, and dexterity in ASIMO, Actuators, sensors, and hardware components used, Communication Capabilities of ASIMO, Introduction to NAO Humanoid Robotics, NAO Robot Vision and Perception, NAO robot features, capabilities and limitations of the NAO robot, Social and cognitive aspects of human-robot interaction.

Unit-II

Humanoid Mechanism and Design, Kinematics and Dynamics of a humanoid robot, Zero Moment Point (ZMP) overview, Measurement of ZMP, 2D and 3D walking pattern generation.

Unit-III

Motion Planning and Control: Robot-Whole body motion, Whole body motion patterns to dynamically stable motion, remote operation of humanoid robot.

Unit-IV

Introduction to Memory Modeling in Humanoid Robotics. Memory Architectures: Von Neumann architecture, Neural network-inspired memory architectures, Hybrid memory systems. Memory Modeling Applications: Natural language processing and dialogue systems. Object recognition and scene understanding, Behavior adaptation and learning.

Unit-V

Application of Humanoids: Humanoid Robots for Entertainment-Theme park, Humanoid Robots in Education-Robots role in teaching, Humanoid-like robot in Special Education. Next generation Industrial Robot, Inclusion of Humanoid Robots in Human Society-Ethical issues.

RECOMMENDED BOOKS

- Kajita, Shuuji, Hirohisa Hirukawa, Kensuke Harada, and Kazuhito Yokoi. Introduction to humanoid robotics. Vol. 101. Springer Berlin Heidelberg, 2014.
- Nenchev, Dragomir N., Atsushi Konno, and Teppei Tsujita. Humanoid robots: Modeling and control. Butterworth-Heinemann, 2018.
- Burdet, Etienne, David W. Franklin, and Theodore E. Milner. Human robotics: neuromechanics and motor control. MIT press, 2013.
- Henze, Bernd. Whole-Body Control for Multi-Contact Balancing of Humanoid Robots: Design and Experiments. Vol. 143. Springer Nature, 2021.
- Lynch, Kevin M., and Frank C. Park. Modern robotics. Cambridge University Press, 2017.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. define the technical aspects of various types of humanoid robot.

CO2. explain the details of mechanism and design of humanoid robot.

CO3. interpret the ZMP and the dynamics of humanoid robot.

CO4. examine the Biped walking pattern.

CO5. determine the whole-body motion of humanoid robot.

CO6. develop the trends of humanoid robot in society.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - IV

Syllabi of Open Category (OC) Courses B.Tech VII Semester (Batch Admitted in 2020-21) (Information Technology/ Internet of Things (IoT)/ Information Technology (Artificial Intelligence and Robotics))

[ITEM IT-6]

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DEPARTMENT OF INFORMATION TECHNOLOGY

IoT AND ITS APPLICATIONS
910203

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To understand basic terminology, concepts, structure, and protocols of IoT.
- To understand Sensors, Devices & Components.
- To attain knowledge of integrated development environment.
- To be able to organize and analyze the vast data of IoT
- To be able to develop different IoT applications.

UNIT I

Introduction to IoT and network architecture– Evolution of Internet of Things (IoT), IoT Components, Impact of IoT, Challenges and security issues in IoT. IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture: Core IoT Functional Stack, IoT data management and compute stack (Cloud, edge, fog).

UNIT II

IoT Protocols: Communication Protocols: IEEE 802.15.4, Zigbee, 6LoWPAN, Z-Wave, Bluetooth. RFID. Networking Protocols: CoAP and MQTT.

UNIT III

Things in IoT: Sensor: light sensor, moisture sensor, temperature sensor, etc. Actuator: DC motor, different types of actuators. Controllers: microcontrollers and their role as a gateway to interfacing sensors and actuators.

IoT Platform overview: Raspberry pi, Arduino Board details. Introduction to Arduino IDE. Embedded 'C' Language basics, Interfacing sensors. LEDs.

UNIT IV

Cloud computing and data analytics in IoT: Introduction to Cloud Computing-Definition, Characteristics. Components, Cloud provider: Microsoft Azure. AWS, Google Cloud. Structured Versus Unstructured Data. Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring. Organizing in IoT.

UNIT V

IoT Applications: Business models for the internet of things, Smart city, Smart mobility and transport, Industrial IoT, Smart health, Environment monitoring and surveillance, Home Automation, Smart Agriculture, Examples for new trends – AI, ML penetration to IoT.

RECOMMENDED BOOKS

- IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.
- Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015.
- Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education.

COURSE OUTCOMES

At the completion of course, student will able to-

CO1. define basic understanding of IoT, its architecture.

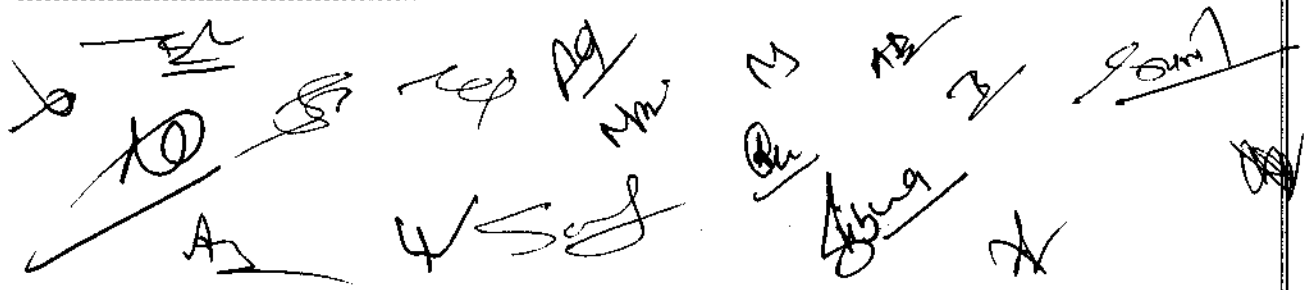
CO2. compare the communication models and protocols for IoT.

CO3. implement hardware and software platforms for application in IoT.

CO4. examine the security issues involved in IoT.

CO5. choose appropriate data analytics and cloud offerings related to IoT.

CO6. develop IoT based applications for real world.



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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFT COMPUTING

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To provide the students the basic understanding of soft computational techniques like neural networks and fuzzy logic, program the related algorithms and design the related systems.
- To understand the theory and concepts of neuro-modelling, different neural paradigms and related applications.
- To understand the basics of evolutionary computing paradigms like genetic algorithm and its application to engineering optimization problems.

Unit I

Introduction to Soft Computing, Concept of computing systems, Soft computing versus Hard computing, Characteristics of Soft computing, Some applications of Soft computing techniques.

Unit II

Artificial Neural Networks- Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architectures, Training techniques for ANNs, Applications of ANNs to solve some real life problems.

Unit III

Genetic Algorithms- Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques. Basic GA framework and different GA architectures. GA operators: Encoding, Crossover, Selection, Mutation, etc., Solving single-objective optimization problems using GAs.

Unit IV

Fuzzy logic- Introduction to Fuzzy logic, Fuzzy sets and membership functions Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, de-fuzzification techniques. Fuzzy Inference System, realistic applications of Fuzzy logic.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit V

Introduction to Optimization Problem, Concept & types of optimization problems, defining an optimization problem, traditional approaches for solving optimization problem, limitations of traditional approaches, applications and examples.

RECOMMENDED BOOKS

- Principles of Soft Computing, S.N. Sivanandam & S.N. Deepa, John Wiley & Sons, 2007.
- Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer).
- Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley), 2005.
- Neural Networks and Learning Machines Simon Haykin (PHI), 3rd edition.

COURSE OUTCOMES

At the completion of course, student will able to-

CO1. define basic concepts of neural networks and fuzzy systems.

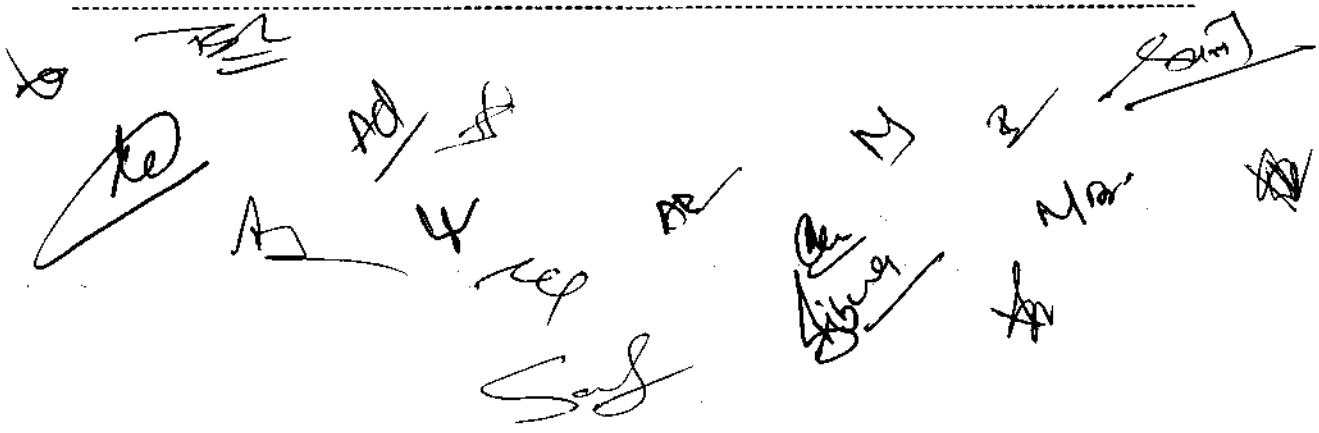
CO2. classify solutions by applying various soft computing approaches for a given problem.

CO3. identify soft computing methods to resolve realistic problems in varieties of application domains.

CO4. analyze artificial neural networks alongwith its applications.

CO5. categorize the basic computational methods as hard or soft.

CO6. determine appropriate soft computing models for solving various real world problems.



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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFTWARE TESTING
910204

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To know about an introduction to software testing, focusing on the principles, techniques, and best practices used in the field.
- To become familiar with the fundamental concepts of software testing and gain practical skills in planning, designing, and executing software tests.
- To cover the various testing methodologies, test case creation, test automation, and defect tracking.

Unit I

Introduction to Software Testing: Importance and goals of software testing, Testing life cycle and its phases, Role of testing in the software development process, Testing principles and fundamentals, V & V Model.

Unit II

Testing Techniques: Black-box and white-box testing, Equivalence partitioning, Boundary value analysis, Decision table testing, State transition testing, Use case testing, Error guessing and exploratory testing.

Unit III

Test Case Design: Test case components, Test case design techniques, Test case prioritization, Test data management, Test coverage criteria, Traceability matrix.

Test Planning and Management: Test planning process, Test strategy and test plan development, Test estimation and scheduling, Test environment setup and management, Test metrics and reporting.

Unit IV

Specialized Testing: Unit testing, Integration testing, System testing, Acceptance testing, Regression testing, Performance testing, Security testing, Usability testing, Compatibility testing, localization testing.

Unit V

Quality Assurance and Best Practices: Quality assurance processes and activities, Code reviews and inspections, Static analysis and code coverage, Test-driven development and agile testing, Emerging trends in software testing

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RECOMMENDED BOOKS

- "Foundations of Software Testing: ISTQB Certification" by Dorothy Graham, Erik van Veenendaal, Isabel Evans, and Rex Black.
- "Software Testing: Concepts and Practices" by Srinivasan Desikan and Gopalaswamy Ramesh.
- "The Art of Software Testing" by Glenford J. Myers, Corey Sandler, and Tom Badgett.
- "Agile Testing: A Practical Guide for Testers and Agile Teams" by Lisa Crispin and Janet Gregory.
- "How Google Tests Software" by James A. Whittaker, Jason Arbon, and Jeff Carollo.

COURSE OUTCOMES

At the completion of course, student will able to-

CO1. understand the fundamental principles and concepts of software testing.

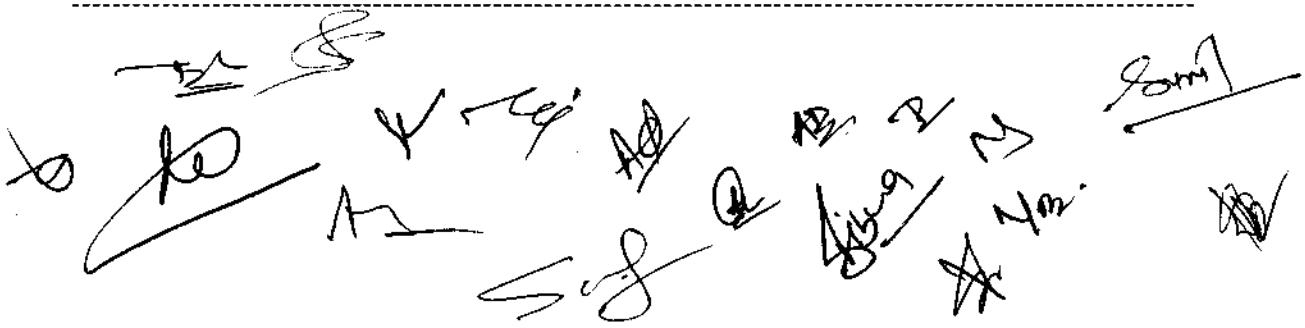
CO2. gain practical knowledge of different testing techniques and methodologies.

CO3. learn to create effective test cases and test plans.

CO4. develop skills in test execution, analysis, and defect tracking.

CO5. understand the role of test automation in software testing.

CO6. apply industry best practices for software testing.



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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - V

Experiment List and Skill Based Mini Projects of Departmental Laboratory Course (DLC) B.Tech VII Semester (Batch Admitted in 2020-21) (Information Technology/ Internet of Things (IoT)/ Information Technology (Artificial Intelligence and Robotics))

[ITEM IT- 7]

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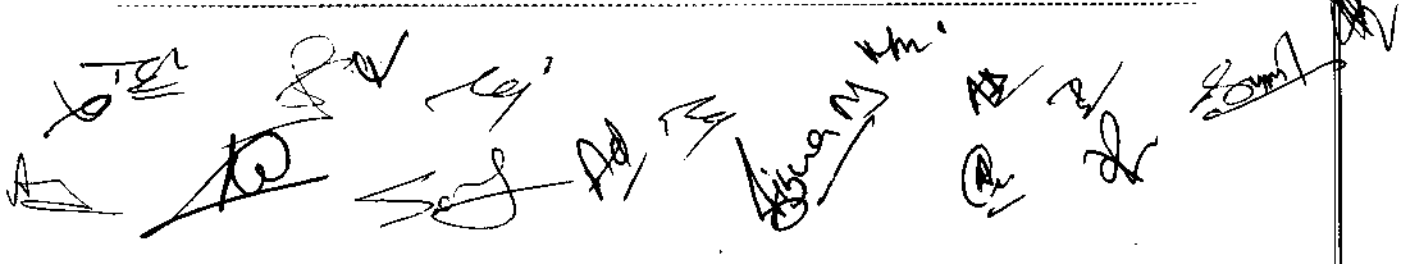
DEPARTMENT OF INFORMATION TECHNOLOGY

ADVANCED ROBOTICS LAB
240701

LIST OF PROGRAMS

1. Introduction to Raspberry Pi.
2. Line following Robot: Build a robot using motors and sensors and program it to follow a line. Use IR sensors to detect the line and control the robot's movement.
3. Obstacle Avoidance Robot: Construct a robot with ultrasonic sensors to detect obstacles in its path and navigate the robot around the obstacle without colliding.
4. Vision-based Object Recognition: Utilize a Raspberry Pi camera module to detect, recognize and classify objects.
5. Maze solving robot: Construct a robot capable of autonomously navigating through a maze. Use sensors to detect walls and program the Raspberry Pi to guide the robot through the maze, making decisions at intersections or dead ends.
6. Remote Control Robot: Create a robot that can be remotely controlled using a smartphone or a computer using Raspberry Pi and Wi-Fi module.
7. Voice controlled Robot: Integrate a microphone and speaker with the Raspberry Pi to create a voice-controlled robot to perform various tasks based on speech commands.
8. Smart Garden: Build a smart garden system to automate watering, monitor soil moisture levels and control lighting conditions using Raspberry Pi. Develop a scheduling algorithm to determine watering intervals and control the irrigation system accordingly.
9. Environment monitoring: Monitor temperature, humidity, air quality and noise level via sensors using Raspberry Pi. The system should provide real-time monitoring, data logging and generate alerts.
10. Home Security: Develop a home security system that utilizes motion detection, image capturing and remote monitoring capabilities to detect intrusion and notify users on the mobile device.
11. Humanoid Robotics (Human-Robot Interaction): Develop a simulated human-robot interaction scenario. Use speech recognition or natural language processing algorithms to enable the robot to understand and respond to user commands or questions in the simulation.
12. Humanoid Robotics (Task Planning and Execution): Design a simulated environment with multiple tasks or objectives. Develop a task-planning algorithm that enables the humanoid robot to autonomously plan and execute a sequence of actions to accomplish the given tasks.



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DEPARTMENT OF INFORMATION TECHNOLOGY

ADVANCED ROBOTICS LAB
240701

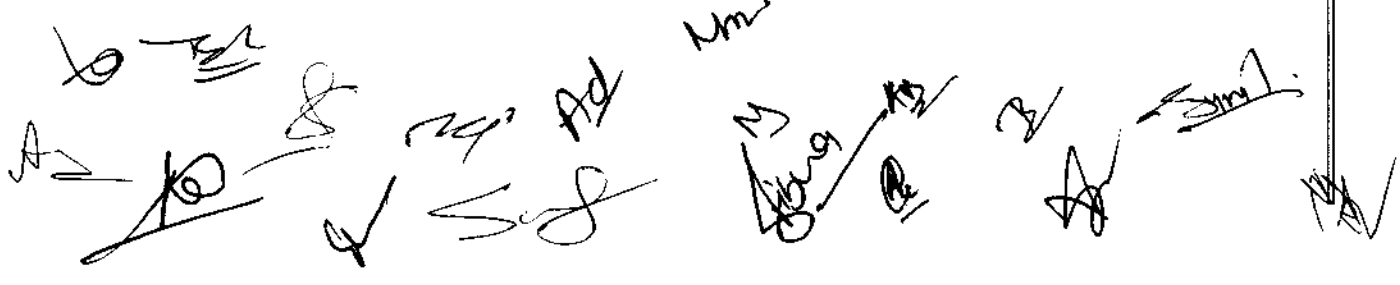
LIST OF MINI SKILL BASED PROJECTS

List of Micro Projects:

1. Light Following Robot: Build a robot that can follow a light source using light sensors or a camera. Develop algorithms to detect the brightest light source and control the robot's movement accordingly.
2. Gesture Controlled Robot: Construct a robot that can be controlled using hand gestures. Utilize sensors like accelerometers or flex sensors to detect gestures, and develop algorithms to interpret the gestures and control the robot's actions.
3. Bluetooth Controlled Robot: Create a robot that can be controlled wirelessly using a smartphone or a computer via Bluetooth. Design a user interface to send commands to the robot and implement the corresponding control system.
4. Obstacle Avoidance Vehicle: Create a robot that uses sensors to detect and avoid obstacles in its path. It can navigate through a cluttered environment without colliding with objects.
5. Maze Mapping: Design a robot with sensors like a gyroscope or accelerometer to create a map of a simple maze. Allow the robot to explore the maze autonomously while recording sensor data and then reconstruct the maze based on the collected information.
6. Gripper Design: Design and build a gripper mechanism using cardboard or 3D printing. Test the gripper's ability to pick up and hold different objects of varying sizes and shapes. Explore different gripping strategies and materials.
7. Robot Perception: Build a robot with advanced perception capabilities, integrating technologies like depth sensing, 3D mapping, and object tracking to enhance its awareness of the environment.
8. Object Recognition and Grasping: Develop a system that uses computer vision techniques to recognize objects in the environment and plan a robotic arm's motion to grasp them accurately.

List of Macro Projects:

1. Autonomous Navigation: Build a robot capable of autonomously navigating through a maze or an unknown environment using sensors such as LiDAR or cameras.



2. Autonomous Driving Vehicle: Build an autonomous vehicle capable of navigating complex road environments, integrating technologies like perception systems, machine learning, and decision-making algorithms to ensure safe and efficient transportation.
3. Industrial Automation: Implement an advanced robotic system for industrial automation, optimizing manufacturing processes, and increasing productivity by integrating robots with sensors, machine vision, and AI algorithms.
4. Path Planning Robots: Develop a robot that determines an optimal or feasible path from a starting point to a desired goal point while avoiding obstacles or constraints in the environment.
5. Robot Soccer Player: Build small robot and develop algorithms for robot control, object detection, and ball tracking to enable the robot to play soccer autonomously.
6. Autonomous Drone: Build a miniature drone capable of autonomously flying and avoiding obstacles using sensors and computer vision techniques.
7. Fire-fighting robot: Build a robot that detects smoke or fire and takes apt measures to extinguish the same. Also, add the feature of detecting any life stuck in fire and alert the authorities.
8. Autonomous Underwater Vehicle: Create a small robot that can navigate and perform tasks underwater, such as exploring underwater environments or collecting data in aquatic environments.

List of Mini Projects:

1. Robotic Arm Manipulator: Develop algorithms and control strategies for precise manipulation tasks, such as assembly, pick-and-place operations, or delicate object handling.
2. SLAM (Simultaneous Localization and Mapping): Implement Simultaneous Localization and Mapping (SLAM) techniques to enable a robot to navigate and build a map of its surroundings in real-time.
3. Swarm Robotics: Develop a group of small robots that can communicate and work together to accomplish tasks. They can coordinate their actions and exhibit emergent behaviour.
4. Exoskeleton Assistance System: Design and build a wearable robotic exoskeleton that can assist individuals with limited mobility in their daily activities, such as walking, lifting objects, or rehabilitation exercises.
5. Soft Robotics: Design a robot with soft and flexible materials that can adapt to different shapes and interact safely with humans.

6. Agricultural Robot: Design and deploy robots for agricultural applications, such as autonomous crop monitoring, precision farming, or harvesting, to optimize resource usage and increase crop yield.
7. Surveillance Robot System: Develop a surveillance system for critical area by designing cooperative UAVs and humanoid robots.
8. Space Exploration Robot: Develop robots for space exploration and extra-terrestrial missions, including tasks like planetary surface exploration, satellite servicing, or sample collection.

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTERNET OF THINGS LAB
160711/ 230701

LIST OF PROGRAMS

1. Introduction to Arduino Board and Arduino IDE (Installation and Setup)
2. Write a Program to develop a basic LED glowing and fading circuit.
3. Write a Program to control the LED using Button and count the number of button pushes, control the intensity of light.
4. Write a Program to read an analog input and prints the voltage to the serial monitor.
5. Write a program to control the fire alarm.
6. Write a Program to Control Electronic Appliances using RELAY SHIELD Sensor after detecting motion using Motion Sensor (PIR sensor).
7. Write a program to control the movement of a stepper motor.
8. Write a program to control electronic appliances using Bluetooth.
9. Write a program to monitor the moisture, temperature, and humidity levels of the surrounding environment.
10. Write a program to determine the pH level and turbidity in water.
11. Write a program to monitor the heartbeat.

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTERNET OF THINGS LAB
160711/ 230701

LIST OF MINI SKILL BASED PROJECTS

List of Micro Projects:

1. Design a sleep detection system using an eye blink sensor.
2. Design a Burglar Alarm system for home security.
3. Distance calculation using ultrasonic sensor
4. Detect the intensity of light using LDR.
5. Design an LED chaser using multiple-colored LEDs.
6. Calculate the heartbeat per minute using a Heart rate monitor
7. Design a Shadow alarm using a light detection resistor.
8. Design a system for water level monitoring.
9. Design an object detection system using an infrared sensor
10. Waste Management: Build an IoT solution for smart waste management, integrating sensors in waste bins to monitor fill levels. Implement optimization algorithms to optimize waste collection routes and reduce operational costs.

List of Macro Projects:

1. Use a PIR sensor to detect the motion and indicate the motion detection with LEDs/bulbs.
2. Design a Digital dice that generates a random number.
3. Using a sound sensor, design a sound pollution monitoring system.
4. Design an electronic door opener using an RFID reader.
5. Using suitable temperature and humidity sensors, design a weather reporting system.
6. Design an Arduino-based mail notifier.
7. Design a smart alarm clock using motion sensors/light sensors etc.
8. Design an automatic light dimmer using light sensors and relay switch.
9. Smart Parking: Create an IoT-based parking system that monitors parking space availability and guides drivers to vacant spots using sensors and mobile applications. Implement real-time updates and payment integration for efficient parking management.
10. Asset Tracking: Create an IoT solution for tracking assets such as vehicles, packages, or equipment. Use GPS or RFID technology to monitor the location and status of assets in real-time and develop a web or mobile application for visualization.

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DEPARTMENT OF INFORMATION TECHNOLOGY

List of Mini Projects:

1. Design a human-following robot using suitable sensors and actuators
2. Design a line following robot using suitable sensors and actuators
3. Design an obstacle-avoiding robot using suitable sensors and actuators
4. Design a Plant watering system using suitable sensors and actuators
5. Design a home automation system using suitable sensors and actuators
6. Design an automated toll deduction system using RFID
7. Design a Fire-fighting robot using suitable sensors and actuators
8. Design a vehicle accident prevention system using suitable sensors and actuators
9. Design theft management using suitable sensors and actuators
10. Design a floor-cleaning robot using suitable sensors and actuators
11. Design Smart sticks for blind people using suitable sensors and actuators
12. Design a Gesture control robot using suitable sensors and actuators
13. Design a Bluetooth-controlled device using HC-05 Bluetooth module
14. Smart Parking: Create an IoT-based parking system that monitors parking space availability and guides drivers to vacant spots using sensors and mobile applications. Implement real-time updates and payment integration for efficient parking management.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - VI

List of Courses under Honours Specialization B.Tech V Semester (Batch Admitted in 2021-22) (Information Technology/ Internet of Things (IoT)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence and Data Science/ Artificial Intelligence and Machine Learning)

[ITEM IT- 8]

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DEPARTMENT OF INFORMATION TECHNOLOGY

List of courses to be opted for Honours specialization in B. Tech V Semester (Information Technology)

Honours* *(to be opted by students of Parent Department)*		
Specialization 1: Artificial Intelligence and Machine Learning	**Specialization 2: Data Analytics**	**Specialization 3: Robotics**
Course Name	**Course Name**	**Course Name**
Fundamentals Of Artificial Intelligence (12 weeks)	Fundamentals Of Artificial Intelligence (12 weeks)	Introduction to Robotics (12 weeks)
Artificial Intelligence : Search Methods For Problem Solving (12 weeks)	Applied Linear Algebra For Signal Processing, Data Analytics And Machine Learning (12 weeks)	Artificial Intelligence : Search Methods For Problem Solving (12 weeks)

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

DEAN (ACADEMICS)
M.I.T.S
GWALIOR

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DEPARTMENT OF INFORMATION TECHNOLOGY

List of courses to be opted for Honours specialization in B. Tech V Semester (Internet of Things)

Honours* *(to be opted by students of Parent Department)*		
Specialization 1: Artificial Intelligence and Machine Learning	**Specialization 2: Systems & Computing**	**Specialization 3: Robotics**
Course Name	**Course Name**	**Course Name**
Fundamentals Of Artificial Intelligence (12 weeks)	Ethical Hacking (12 weeks)	Introduction to Robotics (12 weeks)
Artificial Intelligence : Search Methods For Problem Solving (12 weeks)	Introduction To Algorithms And Analysis (12 weeks)	Artificial Intelligence : Search Methods For Problem Solving (12 weeks)

* **Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

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DEPARTMENT OF INFORMATION TECHNOLOGY

List of courses to be opted for Honours specialization in B. Tech V Semester (Information Technology (Artificial Intelligence and Robotics))

Honours* *(to be opted by students of Parent Department)*	
Specialization 1: Information security	**Specialization 2: IOT**
Course Name	**Course Name**
Cyber security and Privacy	Introduction to Internet of things
Ethical Hacking	Sensor Technologies: Physics, Fabrication, And Circuits

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

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DEPARTMENT OF INFORMATION TECHNOLOGY

List of courses to be opted for Honours specialization in B. Tech V Semester (Artificial Intelligence (AI) and Data Science)

Honours* *(to be opted by students of Parent Department)*	
Specialization 1: Information security	**Specialization 2: IOT**
Course Name	**Course Name**
Cyber security and Privacy	Introduction to Internet of things
Ethical Hacking	Sensor Technologies: Physics, Fabrication, And Circuits

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

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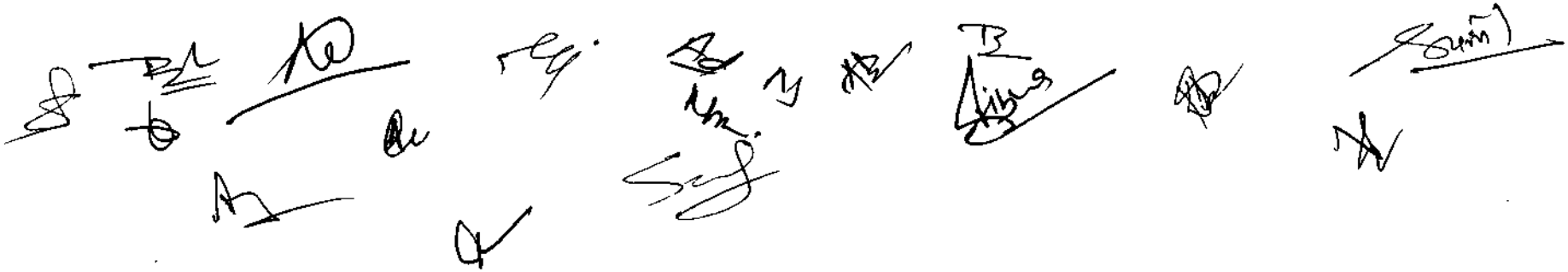
DEPARTMENT OF INFORMATION TECHNOLOGY

List of courses to be opted for Honours specialization in B. Tech V Semester (Artificial Intelligence and Machine Learning)

Honours* *(to be opted by students of Parent Department)*	
Specialization 1: Information security	**Specialization 2: IOT**
Course Name	**Course Name**
Cyber security and Privacy	Introduction to Internet of things
Ethical Hacking	Sensor Technologies: Physics, Fabrication, And Circuits

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**



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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - VII

Scheme
of
B. Tech V Semester
(Batch Admitted in 2021-22)
(Information Technology/ Internet of Things(IoT)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence and Data Science/ Artificial Intelligence and Machine Learning)
Under Flexible Curriculum

[ITEM IT -9]

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. V Semester (IT)

(for batch admitted in academic session 2021-22)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P			
				End Sem. Exam.	Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project							
1.	160511	BSC	Discrete Structures	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP
2.	160512	DC	Data Science using Python	50	10	20	20	60	20	20	200	3	-	2	4	Blended	MCQ
3.	160513	DC	Theory of Computation	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
4.	160514	DC	Microprocessor & Interfacing	50	10	20	20	60	20	20	200	3	-	2	4	Blended	PP
5.	160515	DC	Soft Computing Techniques	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
6.	160516	DLC	Minor Project-I*	-	-	-	-	60	40	-	100	-	-	4	2	Offline	SO
7.	160517	Seminar Self Study	Self-learning Presentation (SWAYAM NPTEL / MOOC)#	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	160518	DLC	Summer Internship Project-II (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				**250**	**50**	**100**	**100**	**350**	**140**	**60**	**1050**	**14**	**02**	**18**		-	-
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**													

$ proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

*** The minor project-I may be evaluated by an internal committee for awarding sessional marks.**

 # Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
04	-	12	08	01	13	-	03	08	01	25
16%	-	48%	32.00%	4.00%	52.00%	-	12.00%	32.00%	4.00%	Credits %

DEAN (ACADEMICS)
M.I.T.S.
GWALIOR

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List of courses to be opted for Minor specialization in V Semester

Minor specialization * *(to be opted by students of Other Department)*	
Course Code	**Course Name**
IT0521M2	Programming in Java (12 Weeks)
IT0520M1	Introduction to Operating Systems (8 Weeks)
IT0523M1	Computer Graphics (8 Weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

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Department of Information Technology

Scheme of Evaluation

B. Tech. Internet of Things (IoT) V Semester

(for batch admitted in academic session 2021-22)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation								
				End Sem. Exam.	[$] Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project							
1.	230501	BSC	Discrete Structures	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP
2.	230502	DC	Data Sciences in IoT	50	10	20	20	60	20	20	200	3	-	2	4	Blended	MCQ
3.	230503	DC	Theory of Computation	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
4.	230504	DC	Embedded System & IoT	50	10	20	20	60	20	20	200	3	-	2	4	Blended	PP
5.	230505	DC	Soft Computing Techniques	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
6.	230506	DLC	Minor Project-I[**]	-	-	-	-	60	40	-	100	-	-	4	2	Offline	SO
7.	230507	Seminar/ Self-Study	Self-learning/Presentation (SWAYAM/NPTEL/ MOOC)[*]	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	230508	DLC	Summer Internship Project-II (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				**250**	**50**	**100**	**100**	**350**	**140**	**60**	**1050**	**13**	**02**	**18**		-	-
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**													

[$] **proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.**

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

[**] The minor project-I may be evaluated by an internal committee for awarding sessional marks.

[*] Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
03	-	12	08	01	12	-	03	08	01	24
12.50%	-	50.00%	33.33%	4.17%	50.00%	-	12.50%	33.33%	4.17%	Credits %

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List of courses to be opted for Minor specialization in V Semester

Minor specialization * *(to be opted by students of Other Department)*	
Course Code	**Course Name**
IO0522M1	Introduction to Internet of Things (12 Weeks)
IO0522M2	Introduction to Operating Systems (8 Weeks)
IO0523M1	Computer Graphics (8 Weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

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Department of Information Technology

Scheme of Evaluation

B. Tech. in Information Technology (Artificial Intelligence and Robotics)

V Semester

(for batch admitted in academic session 2021-22)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation								
				End Sem. Exam.	Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project							
1.	240501	BSC	Discrete Structures	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP
2.	240502	DC	Data Science using Python	50	10	20	20	60	20	20	200	3	-	2	4	Blended	MCQ
3.	240503	DC	Theory of Computation	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
4.	240504	DC	Robotics System and Control	50	10	20	20	60	20	20	200	3	-	2	4	Blended	PP
5.	240505	DC	Soft Computing Techniques	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
6.	240506	DLC	Minor Project-I **	-	-	-	-	60	40	-	100	-	-	4	2	Offline	SO
7.	240507	Seminar/ Self-Study	Self-learning/Presentation (SWAYAM/NPTEL MOOC)#	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	240508	DLC	Summer Internship Project-II (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
			Total	250	50	100	100	350	140	60	1050	13	02	18		-	-
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization													

* proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

The minor project-I may be evaluated by an internal committee for awarding sessional marks.

 # Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
03	-	12	08	01	12	-	03	08	01	24
12.50%	-	50.00%	33.33%	4.17%	50.00%	-	12.50%	33.33%	4.17%	Credits %

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List of courses to be opted for Minor specialization in V Semester

Minor specialization * *(to be opted by students of Other Department)*	
Course Code	**Course Name**
AI0522M2	Introduction to Operating Systems (8 Weeks)
AI0522M3	Programming, Data Structures and Algorithms in Python (8 Weeks)
AI0523M1	Computer Graphics (8 Weeks)

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

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Department of Information Technology

Scheme of Evaluation

B. Tech. V Semester *(Artificial Intelligence (AI) and Data Science)*

(for batch admitted in academic session 2021-22)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P			
				End Sem. Exam.	Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project							
1.	270501	DC	Information Retrieval	50	10	20	20	-	-	-	00	2	1	-	3	Blended	PP
2.	270502	DC	Data Science using Python	50	10	20	20	60	20	20	200	3	-	2	4	Blended	MCQ
3.	270503	DC	Theory of Computation	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
4.	270504	DC	Computer Graphics & Multimedia	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
5.	270505	DC	Soft Computing Techniques	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
6.	270506	DLC	Minor Project-I **	-	-	-	-	60	40	-	100	-	-	4	2	Offline	SO
7.	270507	Seminar/ Self-Study	Self-learning/Presentation (SWAYAM/NPTEL / MOOC)#	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	270508	DLC	Summer Internship Project-II (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
			Total	**250**	**50**	**100**	**100**	**350**	**140**	**60**	**1050**	**12**	**03**	**18**		-	-
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**													

* proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral

** The minor project-I may be evaluated by an internal committee for awarding sessional marks.

Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	15	08	01	12	-	03	08	01	24
-	-	62.50%	33.33%	4.17%	50.00%		12.50%	33.33%	4.17%	Credits %

DMA (ACADEMICS)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous Institute& NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)

Department of Information Technology

List of courses to be opted for Minor specialization in V Semester

Minor specialization * *(to be opted by students of Other Department)*	
Course Code	**Course Name**
AD0523M1	Database Management System (8 Weeks)
AD0523M2	Programming, Data Structures and Algorithms in Python (8 Weeks)
AD0523M3	Introduction to Internet of Things (12 Weeks)

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

DEAN (ACADEMICS)

DEAN (ACADEMICS)
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(A Govt. Aided UGC Autonomous Institute& NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)

Department of Information Technology

Scheme of Evaluation

B. Tech. V Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2021-22)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P			
				End Sem. Exam.	Proficiency in subject /course	Mid Sem. Exam	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project							
1.	280501	DC	Information Retrieval	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP
2.	280502	DC	Data Science using Python	50	10	20	20	60	20	20	200	3	-	2	4	Blended	MCQ
3.	280503	DC	Theory of Computation	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
4.	280504	DC	Computer Graphics & Multimedia	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
5.	280505	DC	Soft Computing Techniques	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
6.	280506	DLC	Minor Project-1 **	-	-	-	-	60	40	-	100	-	-	4	2	Offline	SO
7.	280507	Seminar/ Self-Study	Self-learning/Presentation (SWAYAM/NPTEL/ MOOC)#	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	280508	DLC	Summer Internship Project-II (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
			Total	**250**	**50**	**100**	**100**	**350**	**140**	**60**	**1050**	**12**	**03**	**18**		-	-
10.	10000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**													

` proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

The minor project-1 may be evaluated by an internal committee for awarding sessional marks.

*** Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation**

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
-	-	15	08	01	12	-	03	08	01	24
-	-	62.50%	33.33%	4.17%	50.00%	-	12.50%	33.33%	4.17%	Credits %

DEAN (ACADEMICS)
M.I.T.S
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Department of Information Technology

List of courses to be opted for Minor specialization in V Semester

Minor specialization * *(to be opted by students of Other Department)*	
Course Code	**Course Name**
AM0523M1	Database Management System (8 Weeks)
AM0523M2	Programming, Data Structures and Algorithms in Python (8 Weeks)
AM0523M3	Introduction to Internet of Things (12 Weeks)

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

DEAN (ACADEMICS)
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DEPARTMENT OF INFORMATION TECHNOLOGY

DISCRETE STRUCTURES
160511

L	T	P	Total Credits
3	1	-	4

COURSE OBJECTIVES

- To perceive the knowledge of basic algebra
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer engineering
- To familiarize the discrete numeric function and generating function

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Unit-I

Finite and Infinite Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Multisets, Functions and Relations, Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains, Pigeonhole Principle.

Unit-II

Prepositional Logic, Syntax, Semantics of ATF (Atomic Formula), WFF (Well Formed Formula's),Validity and Satisfiability of WFF by Quine's Method, Normal and Closure Form of Prepositional Calculus.

Unit-III

Introduction and Basic Terminology of Graphs, Planner Graphs, Multi-Graphs and Weighted Graph, Shortest Path in Weighted Graph, Introduction to Eularian Paths and Circuits, Hamiltonian Paths and Circuits, Introduction to Trees, Rooted Trees, Path Length in Rooted Trees, Spanning Trees and Cut Trees.

Unit-IV

Introduction to Discrete Numeric Functions and Generating Functions, Introduction to Recurrence Relations and Recursive Algorithms, Linear Recurrence Relations With Constant Coefficients, Homogeneous Solutions, Particular Solutions and Total Solutions.

Unit-V

Introduction to Group, Subgroups, Generations and Evaluation of Power, Cosets and Lagrange's Theorem, Group Codes, Isomorphism and Automorphism, Homomorphism and Normal Sub Groups, Ring, Integral Domain and Field.

RECOMMENDED BOOKS

- J. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science. Narsingh Deo: Graph Theory.
- Kenneth Rosen: Discrete mathematics and its applications (6th edition).2006. McGraw-Hill
- C. Liu, D. Mohapatra: Elements of Discrete Mathematics. 2008. Tata McGraw-Hill.
- T. Koshy: Discrete mathematics with applications.2003. Academic Press.
- J. Hein: Discrete structures, logic and computability.2009. Jones & Bartlett Publishers.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concept of set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure.

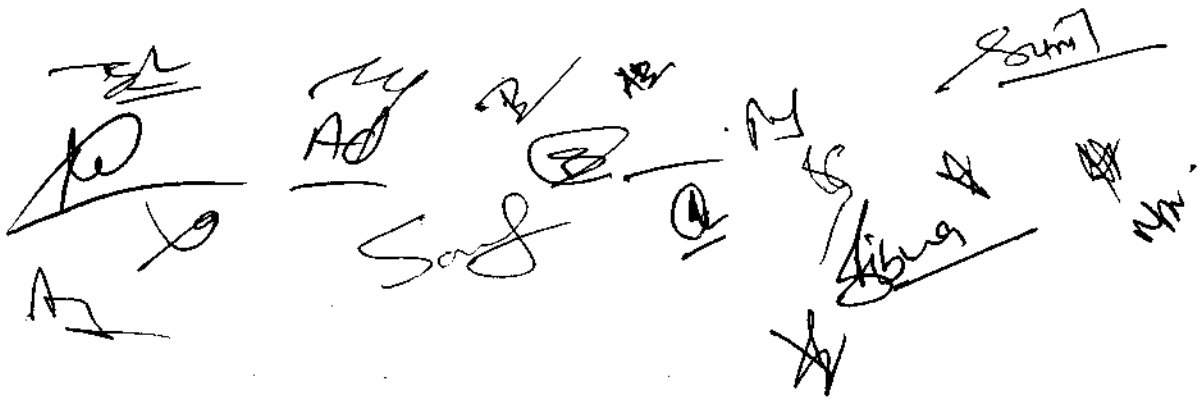
CO2. illustrate the knowledge of course content and distinguish between them in terms of their applications.

CO3. identify the concepts of graph and tree for solving problems in the computer science.

CO4. apply the concepts of studied topics with suitable technique faced in engineering problems

CO5. analyze the set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure to examine the real world problem.

CO6. build analytical skill and interpret applications of engineering beneficial in real time troubleshooting.



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DEPARTMENT OF INFORMATION TECHNOLOGY

INFORMATION RETRIEVAL
270501/280501

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- Comprehend types of text analysis, Information retrieval, IR system architecture.
- Able to categorize and filter the information
- Learn the underlying technologies of modern information retrieval system

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Unit-I

Introduction: Concepts and terminology of information retrieval systems, Significance of information retrieval and storage, Information Retrieval Vs Information Extraction, Text analysis, Types of text analysis, Goals and history of IR, The impact of the web on IR.

Unit-II

Search engine architecture: Basic building blocks of a modern search engine system. Mercator: A Scalable, Extensible Web Crawler, Parallel Crawlers, Different Types of Web Crawler, Page Rank Algorithm.

Unit-III

Language models and Text Processing: Unigram, Bigram language models, generating queries from documents, Text processing: Text format, Tokenization, Lower casing, stop word removal, stemming, lemmatization, Language modelling, query processing and refinement techniques.

Unit-IV

Basic IR Models: Boolean and vector-space retrieval models, Probabilistic Model: Ranked retrieval: Text-similarity metrics: TF-IDF (term frequency/inverse document frequency) weighting; Cosine similarity.

Unit-V

Classification and Clustering: Classification algorithms over the text data, Evaluation in Information Retrieval: Retrieval Performance Evaluation Recall, Precision, Mean average Precision, F-Measure, User Oriented Measures, Discounted Cumulated Gain.

Introduction to sentiment analysis, Document-level sentiment analysis. Sentence-level sentiment analysis.

RECOMMENDED BOOKS:

- Butcher S., Clarke C.L.A. and Cormack G., Information Retrieval (1 ed.), The MIT Press, 2010. ISBN 978-0262026512.
- Ricardo Baeza-Yate, Berthier Ribeiro-Neto, "Modern Information Retrieval", Second Edition, Addison Wesly (2011).
- G. G. Chowdhury "Introduction to Modern Information Retrieval", Second Edition, Neal-Schuman Publishers (2003).
- David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms, and Heuristics", Springer (2004).

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. gain the basic concepts and techniques in Information Retrieval.

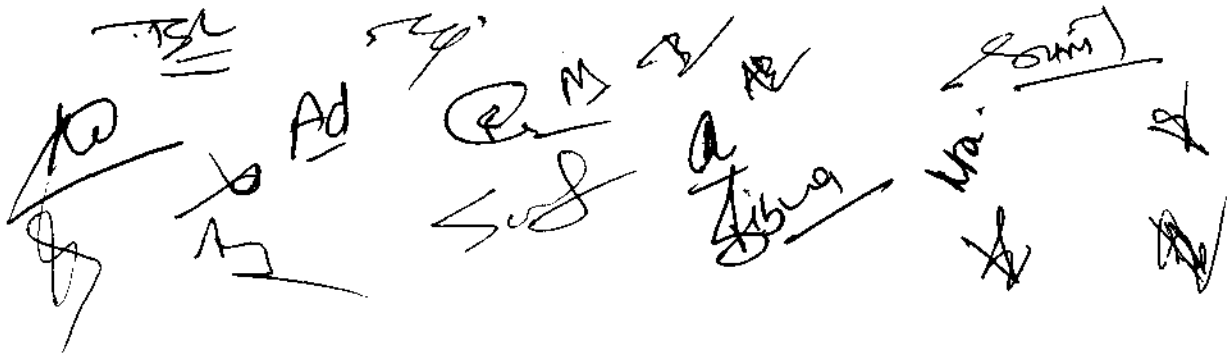
CO2. explain the issues involved in representing and retrieving documents.

CO3. comprehend types of text analysis. Information retrieval, IR system architecture, query processing models and probabilistic models.

CO4. process the text data for the purpose of classification.

CO5. apply the different evaluation strategies to the retrieved results for computing the efficiency and accuracy of the information retrieval model.

CO6. perform indexing, compression, information categorization and sentiment analysis.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCE USING PYTHON
160512/240502/270502/280502

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To provide fundamental knowledge of Data Science.
- To present the basic representation and exploratory data analysis used in Data Science.
- To understand the working of techniques used in Data Science.

Unit-I

Basics of Python Tool, Introduction to Data Science, Various Fields of Data Science, Impact of Data Science, Data Analytics Life Cycle, Data Science Toolkit, Version Controlling.

Unit-II

Understanding data, Types of data: Numeric. Categorical, Graphical, High Dimensional Data, Classification of Digital Data: Structured. Semi-Structured and Unstructured, Source of Data: Time Series, Transactional Data. Biological Data, Special Data, Social Network Data, Data Evolution.

Unit-III

Data Acquisition and Data wrangling: Accessing Database, CSV and JSON Data, Data Cleaning and Transformation using Pandas and Sklearn, Data Visualization, Missing Value Analysis, Correction Matrix, Outlier Detection Analysis, Feature Engineering.

Unit -IV

Descriptive Statistics: Measures of Center and Spread, Estimation Distributions, Inferential Statistics: Sampling Distributions, Hypothesis Testing, Probability Theory. Conditional Probability, Maximizing and Minimizing Algebraic Equations, Matrix Manipulation and Multiplication.

Unit -V

Supervised Learning: Regression, classification, decision trees, random forest, Unsupervised Learning: PCA, Clustering. Application of Data Science, Use Case:

Consumer Product usage Analysis, Search Engines, Targeting Recommendation, Gaming etc.

RECOMMENDED BOOKS

- Introduction to linear algebra - by gilbert strang
- Applied statistics and probability for engineers – by douglas montgomery
- Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing, and Presenting Data – EMC Education
- Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython – Wes McKinney.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. define the fundamentals of data science and its importance.

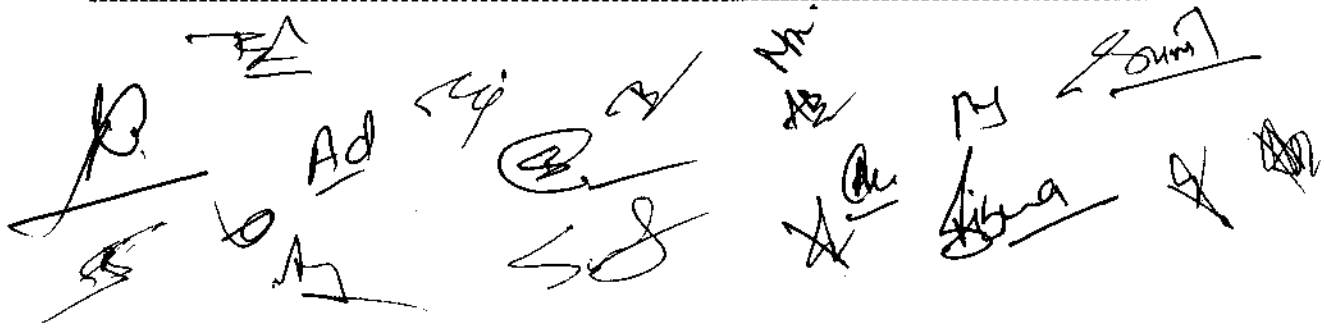
CO2. contrast the basics of python and libraries related to data science

CO3. classify different types of data analytics

CO4. organize the data collected from various sources

CO5. analyze pre-processing and data reduction strategies.

CO6. create the graphical representation of the data through visualization tool on various applications.



MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF INFORMATION TECHNOLOGY

THEORY OF COMPUTATION
160513/230503/240503/270503/280503

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVE

- To understand computability, decidability, and complexity through problem solving.
- To analyse and design abstract model of computation & formal languages
- To understand and conduct mathematical proofs for computation and algorithms.

Unit-I

Introduction of Automata Theory: Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa.

Unit-II

Types of Finite Automata: Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Meaning of union, intersection, concatenation and closure, 2 way DFA.

Unit-III

Grammars: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.

Unit-IV

Push down Automata: example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA, Petrinet model.

Unit-V

Turing Machine: Techniques for construction, Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability

and Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem.

RECOMMENDED BOOKS

- Introduction to Automata Theory Language & Computation, Hopcroft & Ullman, Narosa Publication.
- Element of the Theory Computation, Lewis & Christors, Pearson.
- Theory of Computation, Chandrasekhar & Mishra, PHI.
- Theory of Computation, Wood, Harper & Row.
- Introduction to Computing Theory, Daniel I-A Cohen, Wiley.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concepts of switching and finite automata theory & languages.

CO2. relate practical problems to languages, automata, computability and complexity.

CO3. construct abstract models of computing and check their power to recognize the languages.

CO4. analyze the grammar, its types, simplification and normal form.

CO5. interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.

CO6. develop an overview of how automata theory, languages and computation are applicable in engineering application.

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DEPARTMENT OF INFORMATION TECHNOLOGY

MICROPROCESSOR & INTERFACING
160514

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand different processors and basic architecture of 16 bit microprocessors.
- To understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design.
- To understand 8051 microcontroller.

Unit-I

Microprocessors: Introduction to x86 microprocessors, RISC and CISC processors, 8086 Architecture-Functional Diagram, Register Organization, Memory Segmentation, Programming Model, Memory Address, Physical Memory Organization, Minimum and maximum mode signals, Bus Cycle and Timing Diagrams. Instruction Formats, Addressing Modes, Instruction Set, Interrupts of 8086.

Unit-II

Basic Peripherals and Interfacing: 8212, 8155, 8255. 8755, interfacing with LED's, ADC, DAC, stepper motors and I/O & Memory Interfacing.

Unit-III

Special Purpose Programmable Peripheral Devices and Interfacing: 8253, 8254 programmable interval timer, 8259A programmable interrupt controller and 8257 DMA controllers. Keyboard and Display Interfacing.

Unit-IV

Serial and Parallel Data Transfer: Serial and Parallel data transmission. Types of communication system. Baud rate RS-232C. Modem and various bus standards. USART – 8251A.

Unit-V

Introduction to Microcontrollers: 8051 Microprocessor and its Architectures, Pin Description. Input-Output configurations, Interrupts. Addressing Modes. An overview of 8051 Instruction Set.

RECOMMENDED BOOKS

- The Intel Microprocessors, Architecture, Programming and Interfacing, B.B. Brey, PHI.
- Microprocessor 8086: Architecture, Programming and Interfacing, Sunil Mathur, PHI.
- Advanced Microprocessor and Interfacing, D.V. Hall, Mc-Graw Hill.
- Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing, A.K. Ray & K.M. Bhurchandi, Tata McGraw Hill.
- Interfacing Techniques in Digital Design with Emphasis on Microprocessors, R.L. Krutz, John Wiley.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. compare the architecture and feature of different 16-bit microprocessor interfacing chips & microcontrollers.

CO2. develop programming skills in assembly language of 8086 microprocessor and 8051 microcontroller.

CO3. demonstrate the concept of interfacing with peripheral devices.

CO4. make use of different interrupts and addressing modes.

CO5. design an interfacing for I/O devices.

CO6. build a system based on 8086 microprocessor and 8051 microcontroller.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFT COMPUTING TECHNIQUES
160515/230505/240505

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals, Program the related algorithms and Design the required and related systems.
- To understand the fundamental theory and concepts of neural networks, several neural network paradigms and its applications.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Unit-I

Introduction to Soft Computing: Soft Computing v/s Hard Computing, Basic models of Artificial Neural Networks, Terminologies of ANNs McCulloch-Pitts Neurons, Linear Separability, Hebb Network, Supervised Learning Networks: Introduction, Perceptron Networks, Back Propagation Networks, Radial Basis Function Networks. Hopefield networks.

Unit-II

Fuzzy Set Theory: Fuzzy Sets. Fuzzy Membership Functions, Operations on Fuzzy Sets. Fuzzy Relations. Fuzzy rules, Fuzzy Reasoning, Defuzzification: Lembda-Cuts for Fuzzy sets (Alpha-Cuts), Lembda-Cuts for Fuzzy Relations. Fuzzy Inference System: Introduction. Mamdani Fuzzy Model, Takagi-Sugeno Fuzzy Model.

Unit-III

Evolutionary Algorithm: Traditional optimization and Search Techniques. Basic Terminologies in GA. Operators in Genetic Algorithm. Stopping Condition for Genetic Algorithm Flow. Classification of Genetic Algorithm. Comparison with Evolutionary algorithm. Application of Genetic algorithm.

Unit-IV

Introduction to Nature-Inspired Optimization Algorithms: Particle Swarm Optimization (PSO) Algorithm. Differential Evolution (DE) Algorithm. Artificial Bee

Colony (ABC) Algorithm, Ant Colony Optimization (ACO) Algorithm, Cuckoo Search (CS). Firefly Algorithm (FA), Immune Algorithm (IA), Grey Wolf Optimization (GWO), Spider Monkey Optimization.

Unit-V

Hybrid Soft Computing Techniques: Introduction, Neuro-fuzzy Hybrid system, Adaptive Neuro fuzzy inference system(ANFIS), Genetic Neuro Hybrid system, Application of Soft Computing Techniques.

RECOMMENDED BOOKS

- Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa , Wiley Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications- S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI.
- Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms, Samir Roy and Udit Chakraborty, Pearson.
- Neural Networks and Learning Machines-Simon Haykin PHI.
- Fuzzy Logic and Engineering Application, Tomthy Ross, TMH.
- Evolutionary Optimization Algorithms, D. Simon (2013), Wiley.
- Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications, L. N. de Castro (2006), CRC Press.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define basic concepts of neural network and fuzzy systems.

CO2. compare solutions by applying various soft computing approaches on a given problem.

CO3. develop and train different supervised and unsupervised learning.

CO4. classify various nature inspired algorithms according to their application aspect.

CO5. compare the efficiency of various hybrid systems.

CO6. design a soft computing model for solving real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DISCRETE STRUCTURES
230501/240501

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To perceive the knowledge of basic algebra
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer engineering
- To familiarize the discrete numeric function and generating function

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Unit-I

Finite and Infinite Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Multisets, Functions and Relations, Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains, Pigeonhole Principle.

Unit-II

Prepositional Logic, Syntax, Semantics of ATF (Atomic Formula), WFF (Well Formed Formula's),Validity and Satisfiability of WFF by Quine's Method, Normal and Closure Form of Prepositional Calculus.

Unit-III

Introduction and Basic Terminology of Graphs, Planner Graphs, Multi-Graphs and Weighted Graph, Shortest Path in Weighted Graph, Introduction to Eularian Paths and Circuits, Hamiltonian Paths and Circuits, [redacted]

Unit-IV

Introduction to Discrete Numeric Functions and Generating Functions, Recurrence Relations and Recursive Algorithms, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions and Total Solutions.

Unit-V

Introduction to Group, Subgroups, Generations and Evaluation of Power, Cosets and Lagrange's Theorem, Group Codes, Isomorphism and Automorphism, Homomorphism and Normal Sub Groups, Ring, [redacted]

RECOMMENDED BOOKS

- J. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science. Narsingh Deo: Graph Theory.
- Kenneth Rosen: Discrete mathematics and its applications (6th edition).2006. McGraw-Hill
- C. Liu, D. Mohapatra: Elements of Discrete Mathematics. 2008. Tata McGraw-Hill.
- T. Koshy: Discrete mathematics with applications.2003. Academic Press.
- J. Hein: Discrete structures, logic and computability.2009. Jones & Bartlett Publishers.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concept of set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure.

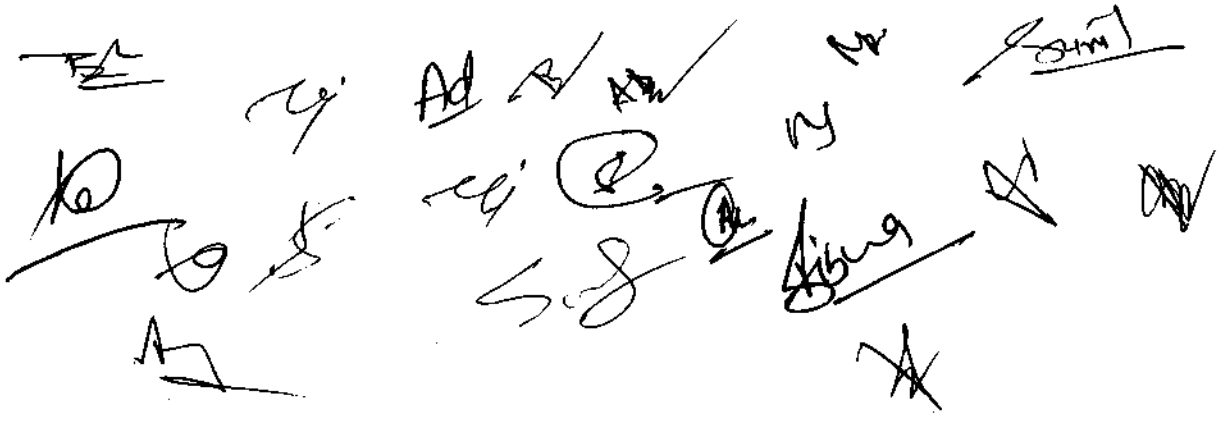
CO2. illustrate the knowledge of course content and distinguish between them in terms of their applications.

CO3. identify the concepts of graph and tree for solving problems in the computer science.

CO4. apply the concepts of studied topics with suitable technique faced in engineering problems.

CO5. analyze the set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure to examine the real world problem.

CO6. build analytical skill and interpret applications of engineering beneficial in real time troubleshooting.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCES IN IOT
230502

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand the key technologies in analytics for IoT.
- To understand the IoT data and requirement of analysis.
- To gain practical, hands-on experience with statistics programming languages, tools.

Unit-I

Introduction to Data Analytics: Defining IoT Analytics and Challenges: The situation, Defining IoT analytics, IoT analytics challenges, Business value concerns, IoT Analytics for the Cloud. Types of Analytics: Streaming Analytics, Spatial, Time Series and Prescriptive Analytics.

Unit-II

Data Collection: Getting to know your data, Types of Data, Data collection strategies, Data Pre-processing, Feature engineering with IoT data, Exploratory Data Analytics, Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis.

Unit-III

Data Visualization and Representation: Model Development Simple and Multiple Regression, Model Evaluation using Visualization, Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making, Box Plots, Pivot Table, Heat Map.

Unit-IV

Strategies to Organize Data for Analytics: Linked Analytical Datasets, Linking together datasets, Managing data lakes, Data retention strategy, Economics of IoT Analytics, Cost considerations for IoT analytics, Thinking about revenue opportunities, The economics of predictive maintenance example, Data Analytics Life Cycle.

Unit-V

Application of Analytics in IoT: IoT based applications, Healthcare, Marketing, Finance, Smart cities, Cyber security, video surveillance, Agriculture and Weather Forecasting and other domains; Real Time IoT based data analysis.

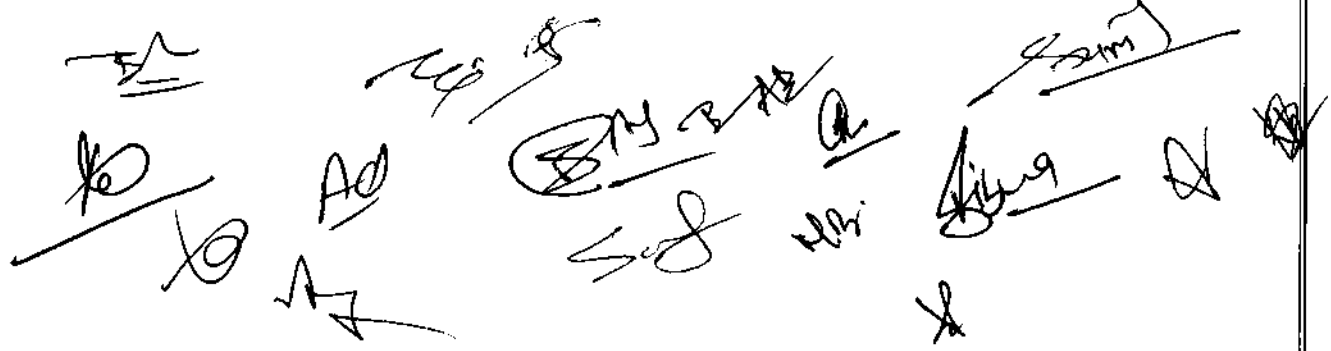
RECOMMENDED BOOKS:

- Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.
- Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
- David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
- Andrew Minteer, Analytics for the Internet of Things "IoT" (1 ed.), Packt Publishing, 2017. ISBN 978-1787120730.
- Hwaiyu Geng, Internet of Things and Data Analytics Handbook (1st st ed.), Wiley, 2017. ISBN 978-1119173649.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the fundamentals of data science and its importance.
CO2. classify the evolution, roles, stages in data science projects.
CO3. analyze the pre-processing and data reduction strategies.
CO4. explain the different data visualization and representation techniques.
CO5. evaluate the performance of algorithms in data science.
CO6. design the different real time applications of data science in IoT.



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DEPARTMENT OF INFORMATION TECHNOLOGY

EMBEDDED SYSTEM & IOT

230504

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions
- To learn ARM microcontrollers to perform various tasks.
- To understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

Unit-I

Embedded and Microcontroller Concepts: Introduction to embedded processors, Application Areas, Categories of embedded processors, Hardware architecture, Software architecture, Application software, Communication software, Introduction to Harvard & Von Neumann Architectures. CISC & RISC Architectures.

Unit-II

Embedded Serial Communication: SPI. SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus), USB. Communication under IoT: IoT Protocol: MQTT, CoAP, XMPP and AMQT, IoT Communication Models. IoT Communication Technologies: Bluetooth. BLE, Zig-Bee, Zwave, NFC, RFID. LiFi. Wi-Fi, Interfacing of Communication Technologies, Embedded Programming.

Unit-III

ARM: ARM design philosophy, data flow model and core architecture, registers, program status register, instruction pipeline, interrupts and vector table, operating modes and ARM processor families. Instruction Sets: Data processing instructions, addressing modes, branch, load, store instructions, PSR instructions, and conditional instructions.

Unit-IV

Raspberry Pi: Raspberry Pi board and its processor, Programming the Raspberry Pi, Communication facilities on Raspberry Pi (I2C, SPI, UART), Interfacing of sensors and actuators.

Unit-V

Intel Galileo or Edison microprocessors for Embedded System and IoT, Application-specific integrated circuit (ASIC), Application-specific standard parts (ASSPs), System-on-Chip (SoC), Field-Programmable Gate Arrays (FPGA), Single Board Computers (SBC).

RECOMMENDED BOOKS

- Muhammod Ali Mazidi, Rolin D. Mckinlay & Danny Sansey, "PIC Microcontroller and Embedded System SPI, UART using Assembly & C for PICI8," Pearson International Edition, 2008.
- A. N. Sloss, D. Symes, and C. Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Elsevier, 2008.
- S. Monk, "Programming the Raspberry Pi" McGraw-Hill Education, 2013
- John .B. Peatman, "Design with PIC Microcontroller", Prentice Hall, 1997.
- Steave Furber, "ARM system-on-chip architecture", Addison Wesley, 2000.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the basic concepts of embedded systems and microcontroller.

CO2. explain the architecture and advanced features of embedded processors and microcontrollers.

CO3. utilize the PIC/ARM processor registers, instruction pipeline, interrupts and architecture.

CO4. examine the instructions, addressing modes, conditional instructions and programming of advanced embedded processors and microcontrollers.

CO5. analyze the architectures, instructions, interfacing and applications of Raspberry Pi board.

CO6. elaborate the advanced intel Galileo or Edison microprocessors for embedded systems for IoT.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ROBOTICS SYSTEM AND CONTROL
240504

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To learn the fundamentals of Robotics.
- To lean fundamentals of robot kinematics.
- To understand Trajectory planning tool and Interface.
- To working Sensor and Actuators in robot.
- To know about Robotics vision and application.

Unit-I

Introduction to Robotics, History of Robotics, Definition, Characteristics, Architecture of Robotic System, Classification of Robots and Robotic Systems, Advantages and Disadvantages of Robots, Application, Robot Components and Functions, Laws of Robotic, Robot Degrees of Freedom, Robot Joints and Co-Ordinate Systems, Sequence of Robotics Action.

Unit-II

Kinematics of Robot, Robots as Mechanisms Open and Closed Kinematic Mechanisms, Matrix Representation and Transformation, Robot Dynamics. Forward and Inverse Kinematics. Forward and Inverse Kinematics Equations, Direct Vs. Inverse Kinematic Task.

Unit-III

Basics of Trajectory Planning, Joint-Space Trajectory Planning, Cartesian-Space Trajectories, Continuous Trajectory Recording, Robot End Effectors, Types of End Effectors, Types of Grippers, Tools and Interface.

Unit-IV

Sensor and Actuators in Robot, Sensors, Type of Sensors, Characteristics of Sensors, Touch, Force/Moment and Tactile Sensors, Actuators, Type of Actuators, Hydraulic, Magnetostrictive Actuators, Pneumatic Devices, Characteristics and Comparison of Actuating Systems, Drive and Control Scheme, Electric Motors, Electro-Active Polymer Actuators.

Unit-V

Robot Vision, Robot Motion Planning, Gross and Fine Motion, Planning Approach, Intelligent Robot, Biped Walking, Robot Workspace, Internet of Robotic Things and Component of Iort, Algorithm for Intelligent System.

RECOMMENDED BOOKS

- Saeed B. Niku, Introduction to Robotics Analysis, Application, Pearson Education Asia, 2001.
- R. K. Mittal and I. J. Nagrath, Robotics and Control, TMH, 2003.
- Computer Vision: Algorithms and Applications, Richard Szeliski, Ed. Springer, 2010.
- Computational Intelligence, Davis Poole, Alan Mackwath, Randy Coehet, Oxford University Press1998.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. illustrate different basic terms related to robotics and their functions

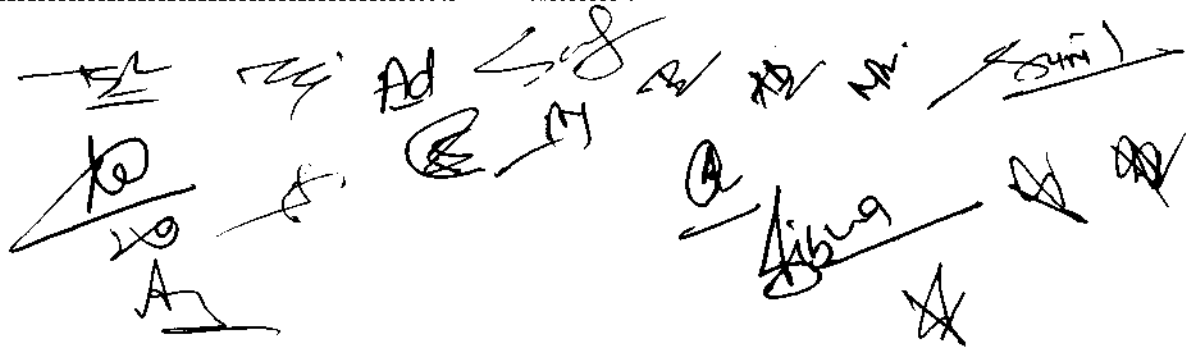
CO2. summarize fundamentals of robot kinematics and control system.

CO3. classify different kind of sensor and actuators used in robotics.

CO4. explain basics of Trajectory planning in robotics and its end effectors.

CO5. know about Robot vision, motion planning and robot application

CO6. describe concept of algorithm for intelligent system and internet of robotics things.



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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER GRAPHICS & MULTIMEDIA
270504/280504

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To become familiar with computer graphics techniques and display devices.
- To enhance the proficiency in image representations, 2D and 3D graphics transformations.
- To develop awareness with various illumination, color models and multimedia system.

Unit-I

Introduction to Computer Graphics: Interactive Computer Graphics, Application of Computer Graphics, Random and Raster Scan Displays, Storage Tube Graphics Display, Calligraphic Refresh Graphics Display, Flat Panel Display, Refreshing, Flickering, Interlacing, Resolution, Bit Depth, Aspect Ratio etc.

Unit-II

Scan Conversion Technique: Image representation, Line drawing: DDA, Bresenham's Algorithm. Circle Drawing: Mid-Point, DDA, Bresenham's Circle Generation Algorithm, Ellipse Generation Algorithm, Curves: Parametric Function, Bezier Method, B-Spline Method.

Unit-III

2D & 3D Transformations: Translation, Rotation, Scaling, Reflection, Shearing, Inverse Transformation, Composite Transformation, World Coordinate System, Viewing Transformation, Representation of 3D object on Screen, Parallel and Perspective Projections.

Unit-IV

Clipping: Point clipping, Line Clipping, Simple Visibility Line Clipping Algorithm, Polygon Clipping, Hidden Surface Elimination: Z- Buffer algorithm and Painter's Algorithm, Area Filling. **Basic Illumination Models:** Diffuse Reflection, Specular Reflection, Phong Shading, Gouraud Shading, Color Models: RGB, YIQ, CMY, HSV.

Unit-V

Multimedia System: An Introduction, Multimedia hardware and software, Multimedia System Architecture, Multimedia Applications and evolving technologies, Multimedia

Authoring. Data & File Format standards, Sampling; Compression standards, Compression through spatial and temporal redundancy.

RECOMMENDED BOOKS

- Donald Hearn and M.P. Becker : Computer Graphics, PHI Publication
- FoleyVandam, Feiner, Hughes : Computer Graphics principle and Practice
- Rogers : Principles of Computers Graphics, TMH
- Sinha and Udai : Computer Graphics, TMH
- Prabhat K. Andleigh, Kiran Thakrar : Multimedia Systems Design, Prentice Hall PTR

COURSE OUTCOMES

After completion of the course students will be able to:

CO1. explore various display devices and applications of computer graphics.

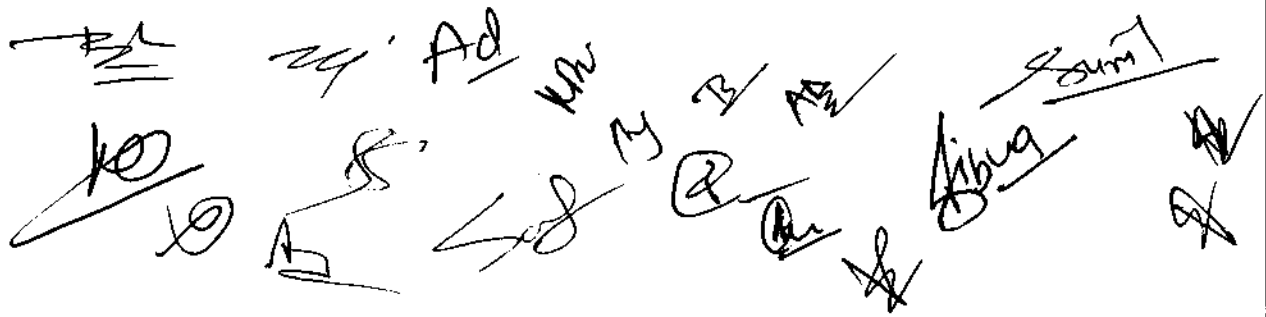
CO2. illustrate various scan conversion techniques like line, circle, curve and shape drawing algorithms.

CO3. apply 2-dimensional, 3-dimensional transformations and projections on images.

CO4. classify methods of image clipping and various algorithms for line and polygon clipping.

CO5. apply appropriate filling algorithms, hidden surface elimination algorithm on images.

CO6. summarize various color models, shading methods and multimedia system.



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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - IX

Experiments List and Skill Based Mini Projects of Laboratory Courses B. Tech V Semester (Batch Admitted in 2021-22) (Information Technology/ Internet of Things (IoT/ Artificial Intelligence and Robotics/ Artificial Intelligence and Data Science/ Artificial Intelligence and Machine Learning) Under Flexible Curriculum

[ITEM IT - 11]

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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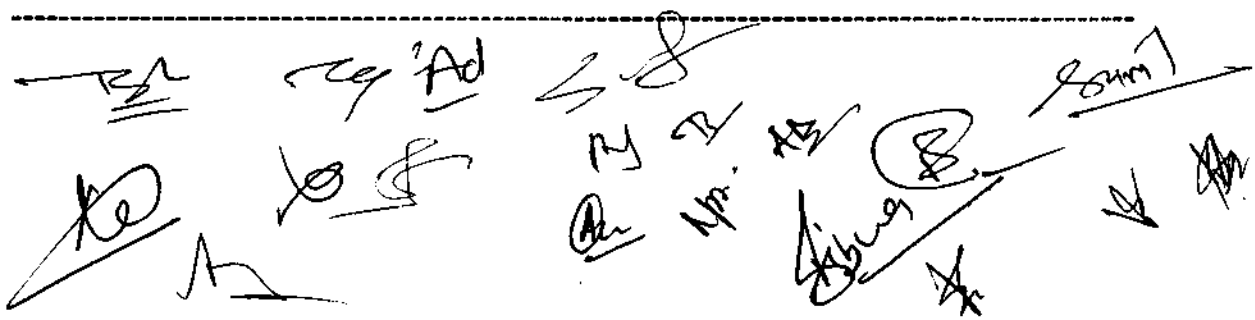
DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCE USING PYTHON
160512/240502/270502/280502

LIST OF PROGRAMS

1. Explore python built-in modules such as os, random, math,scipy and statistics.
2. Write a python program to perform descriptive statistics such as Central Tendency Measures (Mean, Median and Mode), Measure of Dispersion (Variance, Standard Deviation), Skewness and Kurtosis.
3. Study of data science libraries such as Numpy, Pandas etc. for Numerical computations and data manipulation.
4. Explore about data visualization libraries such as Matplotlib, Seaborn etc. in python.
5. Write a python script to draw Correlation matrix, Box plot (show Outliers), Heat map, histogram and Distribution Plot for any Dataset.
6. Write a program to implement Simple Linear Regression model for any Dataset in Python.
7. Write a program to implement Logistic Regression model over any Dataset in Python.
8. With the help of classification algorithm, classify any suitable dataset available over the trusted repository.
9. Implementation of Decision tree using sklearn and its parameter tuning
10. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCE USING PYTHON
160512/240502/270502/280502

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Write a python script to demonstrate how to read different types of data sets (.txt, .csv etc.) from website or disk.
2. Write a python program to calculate the Mean, Median and Mode.
3. Write a script to create a Gaussian curve using python.
4. Draw bar plot and pie plot for any dataset.
5. Write a Program in Python to Join Two Data Frames.
6. Write a python program to find NaN and Null value and replace with any number.
7. Write a python program to calculate Interquartile range (IQR).
8. Write a python program to compute correlation coefficient.
9. Write a python program to calculate the Variance, Standard Deviation, Skewness and Kurtosis.
10. Write a program to calculate Z-Score for any data.

List of Macro Projects:

1. Write a program to show how to apply normalization and standardization in a given dataset.
2. Write a program to identify the missing value in any dataset and how to handle and replace it.
3. Write a program to show one hot encoding in any dataset.
4. Write a program to show label encoding in any dataset.
5. Write a python program to count the frequency of occurrence of a word (Frequency distributions) in a body of text.
6. Write a python program to draw correlation matrix.
7. Write a program to draw residual Plot for any data.
8. Write a program to show various distributions of Data over any Dataset.
9. Write a program to compute weighted averages in Python either defining your own functions or using Numpy.
10. Write a program to plot a scatter plot and Pivot table of a given data.

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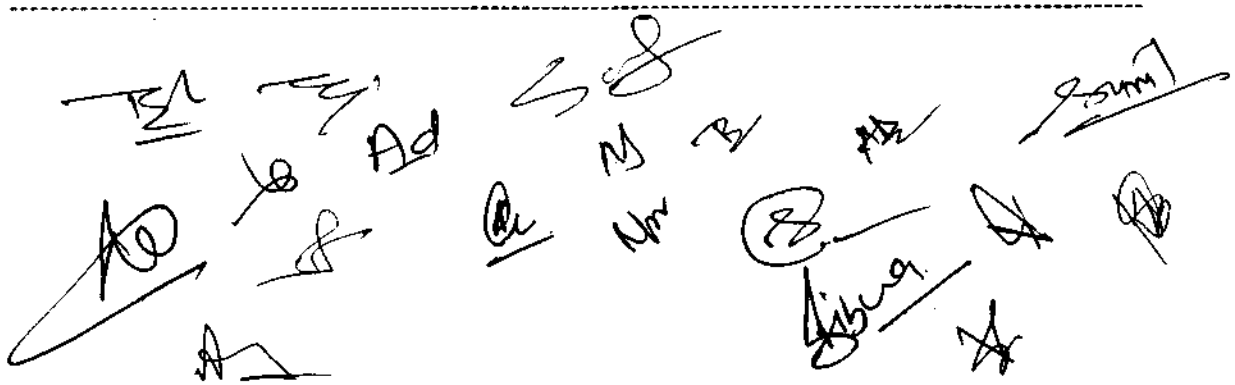
DEPARTMENT OF INFORMATION TECHNOLOGY

List of Mini Projects:

1. Consider any Dataset from online repository to design and implement a Price prediction problem.
2. Consider any Dataset from online repository to design and implement a problem using Linear Regression and Logistic Regression.
3. Consider any Dataset from online repository and demonstrate working of various feature selection and normalization techniques.
4. Design and implement weather forecasting system.
5. Design and implement customer prediction system.
6. Design and Implement Movie Recommendation System.
7. Design and implement House Rent prediction system.
8. Customer Segmentation- Identify segments of customers to target the potential user base using clustering (i.e. K-means clustering). Divide customers into groups according to common characteristics like gender, age, interests and spending habits. Dataset: Mall_Customers dataset.
9. Fake News Detection- ake news is sometimes transmitted through the internet by some unauthorised sources, which creates issues for the targeted person and it makes them panic and leads to even violence. Dataset: fake-news kaggle.
10. Cab Pickups Analysis- cab pickup and distribution, time, days when pickup happens regularly, Dataset: Uber-Pickups dataset.



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DEPARTMENT OF INFORMATION TECHNOLOGY

THEORY OF COMPUTATION
160513/230503/240503/270503/280503

LIST OF PROGRAMS

1. Design a Program for creating machine that accepts three consecutive one.
2. Design a Program for creating machine that accepts the string always ending with 101.
3. Design a program for accepting decimal number divisible by 5.
4. Design a Program for creating machine, which accepts 2 Mod 3.
5. Design a program for creating a machine, which accepts even of 1's and 0's.
6. Design a Program to find 2's complement of a given binary number.
7. Design a Program, which will increment the given binary number by 1.
8. Design a Program to convert NDFA to DFA.
9. Design a program to create PDA to accept $a^n b^n$ where n>0.
10. Design a Program to create PDA machine that accept the well-formed parenthesis.
11. Design a program to create PDA to accept WCWR where w is any string, WR is reverse of that string, and C is a Special symbol.
12. Design a Turing machine that accepts the following language an $b^n c^n$ where n>0.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. judge various computational models.

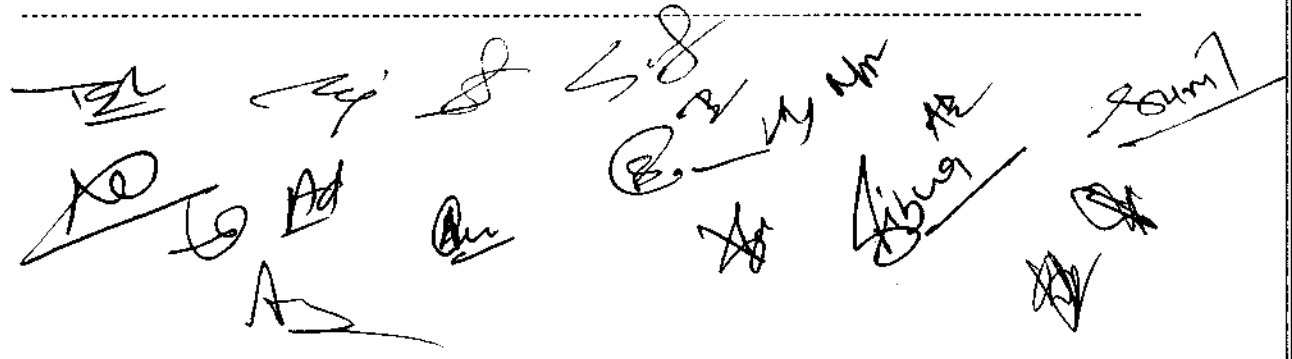
CO2. construct abstract models of computing.

CO3. justify the power of abstract models in computing to recognize the languages.

CO4. demonstrate analytical thinking and intuition for problem solving in the related areas.

CO5. discuss the limitations of computation in problem solving.

CO6. follow set of rules for syntax verification.



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DEPARTMENT OF INFORMATION TECHNOLOGY

THEORY OF COMPUTATION
160513/230503/240503/270503/280503

LIST OF SKILL BASED MINI PROJECT

Note: Use JFLAP (Java Formal Languages and Automata Package) tools.

List of Micro Projects:

1. Study of JFLAP (Java Formal Languages and Automata Package) tools
2. Create Deterministic Finite Automata (DFA)
3. Create Nondeterministic Finite Automata (NFA)
4. Perform Conversion of NFA to DFA
5. Perform DFA Minimization
6. Design a Program for creating machine that accepts three consecutive one.
7. Design a machine that performs DFA to regular grammar conversion.
8. Design a machine that performs DFA to regular expression conversion.
9. Design a machine that performs Regular expression to DFA conversion.

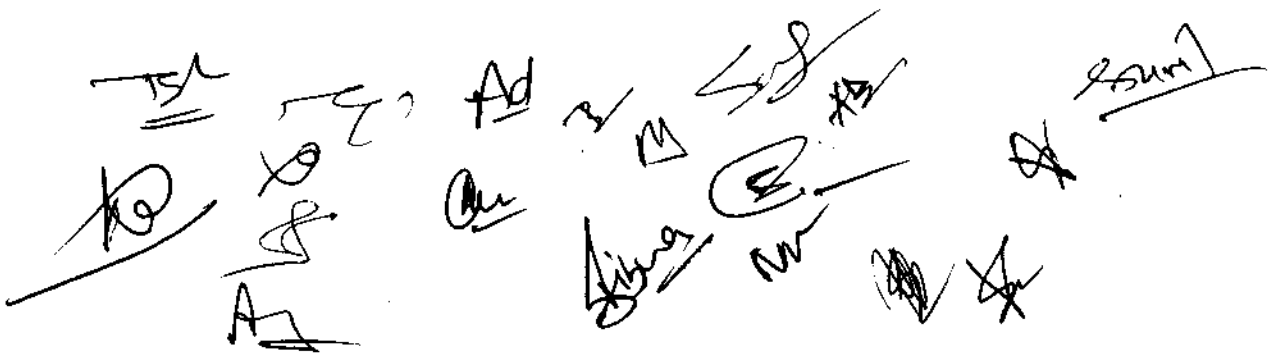
List of Macro Projects:

1. Design DFA which check whether the given unary number is divisible by 5.
2. Design DFA which checks whether the given number is even.
3. Design DFA for the string that always end with 00 using JFLAP tool.
4. Design DFA which accepts only those string which start with 1 and end with 0.
5. Design DFA which accepts even number of 0's and 1's.
6. Design a Moore machine to generate 1's complement of given binary number.
7. Design a Melay machine to generate 2's complement of given binary number.
8. Design a Moore machine which will increment the given binary number by 1.
9. Design a Melay machine for the input symbol 0,1,2 and print residue modulo of 7 of input treated as ternary number.

List of Mini Projects:

1. Design a machine that takes input NDFA and coverts it into DFA.
2. Design a Turing Machine that calculate 2's complement of given binary string.
3. Design a Turing Machine, which will increment the given binary number by 1.
4. Design a Turing Machine that's accepts the following language $a^n b^n c^n$ where n>0.
5. Design a Turing Machine to accept WR where w is any binary string and WR is reverse of that string.
6. Construct a machine to recognize signed or unsigned decimal number.

7. Construct a machine to recognize string, which ends with Gwalior or Bhopal.
8. Design a machine which accept at least single a followed by at least single b followed by at least single c.
9. Design a machine that will read sequence made up of letter A,E,I,O,U and will give as output the same sequences except that in case where an I directly follows an E, it will be changed to u.
10. Design a machine for binary input sequence such that if it has substring 101 the machine outputs A if input has substring 110 it outputs B otherwise it Output C.
11. Design a machine which accepts the string consist of a & b in which number of a's are more than number of b's.
12. Design a machine which accepts the string consist of a & b in which number of a's are less than number of b's.
13. Construct a machine for checking the palindrome of the string of even length.



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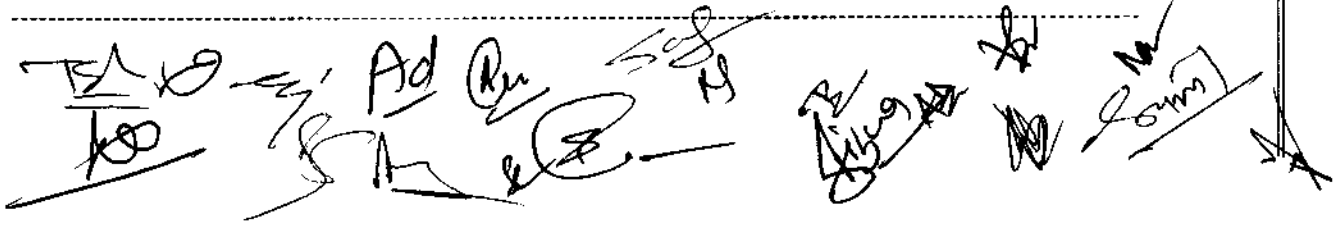
DEPARTMENT OF INFORMATION TECHNOLOGY

MICROPROCESSOR & INTERFACEING
160514

LIST OF EXPERIMENTS

1. Write an assembly language program to perform the subtraction of two 8-bit number using 8085/8086 instruction set.
2. Write an assembly language program to move data block starting at location 'X' to location 'Y' without overlap using 8085/8086 instruction set.
3. Write an assembly language program to move data block starting at location 'X' to location 'Y' with overlap using 8085/8086 instruction set.
4. Write an assembly language program to arrange set of 8-bit numbers starting at location in ASCENDING/DESCENDING order. Display the stored vector in address data field using 8085/8086 instruction set.
5. Write an assembly language program to perform the multiplication of two 8-bit numbers using 8085/8086 instruction set.
6. Write an assembly language program to perform the division of two 8-bit numbers using 8085/8086 instruction set.
7. Write an assembly language program to find the larger number in array of data using 8085/8086 instruction set.
8. Write an assembly language program to convert two BCD numbers in memory of the equivalent HEX number using 8085/8086 instruction set.
9. Write an assembly language program to convert given hexadecimal number into its equivalent BCD number using 8085/8086 instruction set.
10. Write an assembly language program to convert given hexadecimal number into its equivalent ASCII number using 8085/8086 instruction set.
11. Write an assembly language program to convert given ASCII character into its equivalent hexadecimal number using 8085/8086 instruction set.
12. Write an ALP program to generate a Fibonacci series using 8085/8086 instruction set.
13. Write an ALP to find the factorial of a given number using recursive procedure using 8085/8086 instruction set.
14. Write an ALP to separate odd and even numbers using 8085/8086 instruction set.
15. Write an ALP to separate positive and negative numbers using 8085/8086 instruction set.
16. Write an ALP to transfer of a string in forward direction using 8086 instruction set



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COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. differentiate the various types of instructions and addressing modes.

CO2. identify the Hex code/ Machine code of instructions in assembly language.

CO3. perform interfacing of various peripheral devices and memory with microprocessor.

CO4. demonstrate the arithmetic & Logical operation using instruction set of 8086 /8051 microprocessor.

CO5. use of 8086/8051 for interfacing with I/O devices.

CO6. build the assembly language programs in 8086/8051 to solve real world problems.

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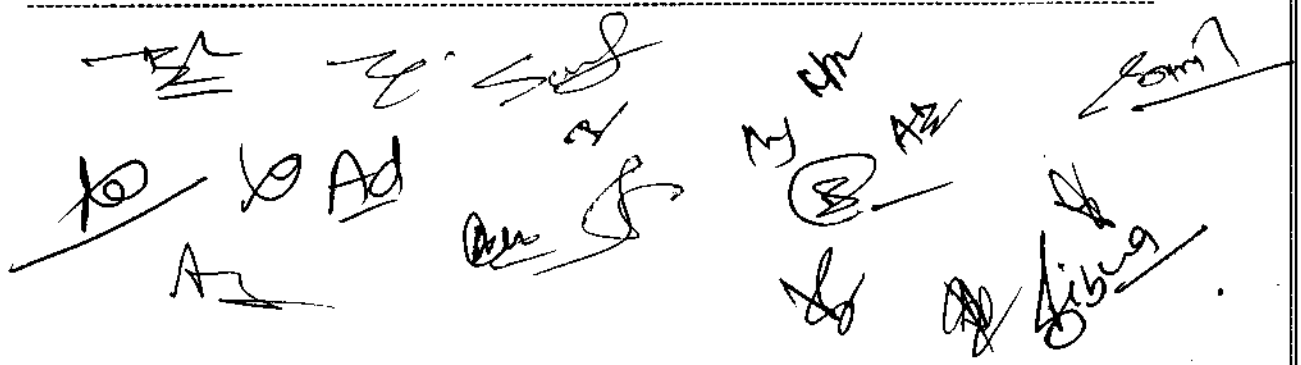
DEPARTMENT OF INFORMATION TECHNOLOGY

MICROPROCESSOR & INTERFACEING
160514

LIST OF SKILL BASED MINI PROJECT

1. Traffic light controller using 8085/8086 microprocessor.
2. Night light saver using 8085/8086 microprocessor.
3. Interfacing 8085 with Stepper Motor controller.
4. Interfacing 8085 with DC motor controller.
5. Interfacing 8085 with keypad.
6. Interfacing 8085 with LED's.
7. Interfacing 8085 with switches.
8. Interfacing 8085 with ADC.
9. Interfacing 8085/8086 with 8255 PPI.
10. Interfacing 8085/8086 with 8251.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCES IN IOT
230503

LIST OF PROGRAMS

1. Explore python built-in modules such as os, random, math and statistics.
2. Write a python program to perform descriptive statistics such as Central Tendency Measures (Mean, Median and Mode), Measure of Dispersion (Variance, Standard Deviation), Skewness and Kurtosis.
3. Study of data science libraries such as Numpy, Pandas etc. for Numerical computations and data manipulation.
4. Explore about data visualization libraries such as Matplotlib, Seaborn etc. in python.
5. Write a python script to draw Correlation matrix, Box plot (show Outliers), Heat map, histogram and Distribution Plot for any Dataset.
6. Write a program to perform Exploratory Data Analysis over any Dataset.
7. Write a program to implement Simple Linear Regression model for any Dataset in Python.
8. Write a program to implement Multiple Linear Regression model for any Dataset in Python.
9. Write a program to implement Logistic Regression model over any Dataset in Python.
10. With the help of classification algorithm, classify any suitable dataset available over the trusted repository.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCE IN IoT
230502
LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Write a python script to demonstrate how to read different types of data sets (.txt, .csv etc) from website or disk.
2. Write a python program to calculate the variance.
3. Write a script to create a normal curve using python.
4. Draw bar plot and pie plot for any dataset.
5. Write a Program in Python to Join Two Data Frames.
6. Write a python program to find NaN and Null value and replace with any number.
7. Write a python program to calculate Interquartile range (IQR).
8. Write a python program to compute correlation coefficient.
9. Write a program to create a data frame using a list of elements.
10. Write a program to calculate Z-Score for any data.

List of Macro Projects:

1. Write a program to show how to apply normalization and standardization in a given dataset.
2. Write a program to identify the missing value in any dataset and how to handle and replace it.
3. Write a program to show binary hot encoding in any dataset.
4. Write a program to show multiclass encoding in any dataset.
5. Write a python program to count the frequency of occurrence of a word (Frequency distributions) in a body of text.
6. Write a python program to draw correlation matrix.
7. Write a program to draw residual Plot for any data.
8. Write a program to show various distributions of Data over any Dataset.
9. Write a program to compute weighted averages in Python either defining your own functions or using Numpy.
10. Write a program to plot a scatter plot and Pivot table of a given data.

List of Mini Projects:

1. Consider any Dataset from online repository to design and implement a Price prediction problem.

2. Consider any Dataset from online repository to design and implement a problem using Linear Regression.
3. Consider any Dataset from online repository to design and implement a problem using Logistic Regression.
4. Consider any Dataset from online repository and perform Data pre-processing steps (including data wrangling and visualization).
5. Consider any Dataset from online repository and demonstrate working of various feature selection and normalization techniques.
6. Consider any Dataset of IoT devices and find out important insights from Data.
7. Design and implement weather forecasting system.
8. Design and implement customer prediction system.
9. Design and Implement Movie Recommendation System.
10. Design and implement House Rent prediction system.

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DEPARTMENT OF INFORMATION TECHNOLOGY

EMBEDDED SYSTEMS & IOT
230504

LIST OF PROGRAMS

1. Introduction to ARM/ RaspberryPi Boards (Installation and Setup)
2. Write a Program to read an analog input and print the voltage to the serial monitor.
3. Write a Program to Control Electronic Appliances using RELAY SHIELD Sensor.
4. Write a Program to detect presence of smoke using Smoke Sensor.
5. Write a program to interface a range sensor with an arduino board and understand the principle behind an ultrasonic range sensor.
6. Write a program to interface DHT11 and Range sensor using a single board.
7. Write a program to show sensor data (DHT11, Time, Message, Countdown) on LCD Display.
8. Write a program to demonstrate MQTT- Publish/ Subscribe concept using IoT Device.
9. Write a program to demonstrate the concept of MQTT- Broker using IoT Device.
10. Write a program to send and receive messages to IoT Devices using MQTT.
11. Write a program to demonstrate different Iot Protocols STOMP, DDS, XMPP, SSE, LwM2M or Lightweight M2M, LPWAN, CoAP, Bluetooth and WiFi etc.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the basic concept of Embedded System.

CO2. describe the basic principles of Arduino programming and IDE.

CO3. familiarize with different types of sensors and related systems.

CO4. design, implement, debug and test programs/ systems.

CO5. design and develop Smart systems applications.

CO6. interface different sensors to embedded boards like arduino

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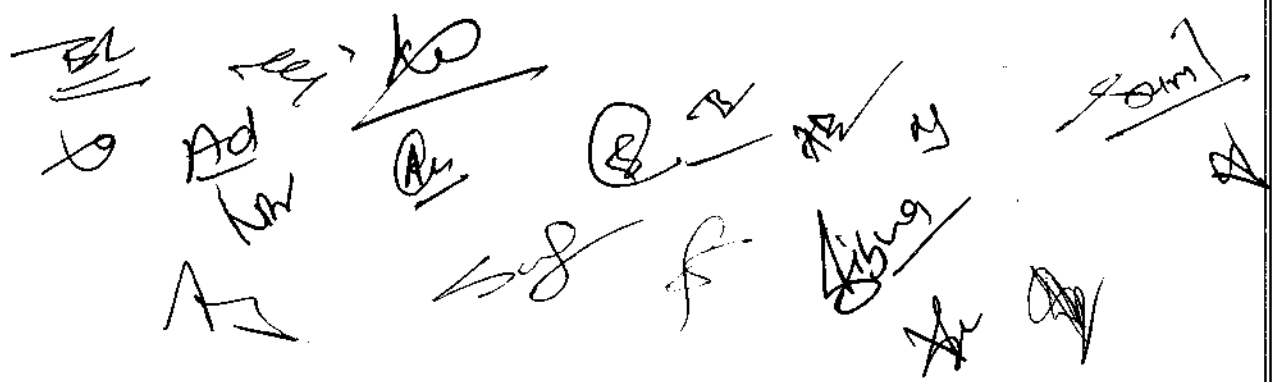

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EMBEDDED SYSTEMS & IOT
230504

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Write a Program to Blink LED (Turn an LED on and off).
2. Write a Program to demonstrate the use of analog output to fade an LED.
3. Write a Program to count the number of buttons pushes.
4. Write a Program to Control an LED using Button.

List of Macro Projects:

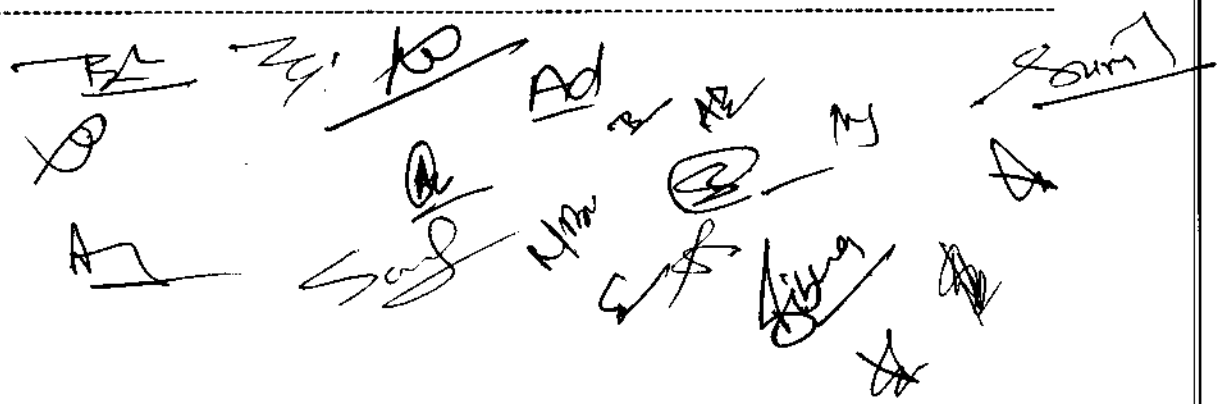
1. Write a program to detect objects using IR Obstacle Sensor.
2. Write a program to detect the presence of Gas using a GAS Sensor.
3. Write a Program to measure Temperature and Humidity using DHT11 Sensor.
4. Write a program to detect motion using Motion Sensor (PIR sensor).

List of Mini Projects:

1. Design intelligent home locking system using a stepper motor (working as a lock) and nodeMCU (as a wireless transmitter and receiver) interfaced to ARM/ RaspberryPi.
2. Design Intelligent water level management system using through depth sensor the ARM/ RaspberryPi alerts the user through call by using GSM module, (NodeMCU). The proposed system evacuates the water to a storage tank through a submersible water pump.
3. Design and development of a RFID based Room Automation using microcontroller. RFID system uses Radiofrequency electromagnetic fields to transfer data from a RFID tag to identify and track the object. This system will apply Radio Frequency technology, which consists of RFID Tags, RF Readers with antennas, Arduino, transmitter- receiver, and added networking properties to identify and track objects.
4. Design and development of an IoT-based smart home automation system using a microcontroller-based RaspberryPi board and mobile-based Short Message Service (SMS) application working functionality with Wi-Fi connectivity to establish communication between the ARM/ RaspberryPi module and automated home appliances.
5. Design and development Intelligent Automatic Irrigation System using an RaspberryPi, servo motor to control and sense the thing in the projects such as sense or measure the moisture in the soil we are using soil moisture sensor. The RaspberryPi sends the signals

to the relay module and the water pump is turned on for some time and can change the time by modifying the code.

6. Design and Development of Motion Detection system using Raspberry-pi / Arduino UNO, Motion Sensor.
7. Design and Development of Air Quality Monitoring System, which will provide real-time data related to the current air quality in the room through the use of sensors and microcontrollers, data will be sent to computer using MQTT protocol. Demonstrate dust density of the room in real-time on GUI.



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DEPARTMENT OF INFORMATION TECHNOLOGY

ROBOTICS SYSTEM AND CONTROL
240504

LIST OF PROGRAMS

1. Programming a simple Robot on Wheels.
2. Experiments based on Humanoid Robot.
3. Programming a Walking Robot.
4. Line Detection/followers robot.
5. Path detection robot.
6. Obstacle detection and avoidance Robotic vehicle using ultrasonic sensor.
7. Path follower robot.
8. Human following robot using Arduino/Jetson Nano/Raspberry-pi.
9. Depth sensing /Edge detection robot using Jetson.

COURSE OUTCOMES

After completion of this course. the students would be able to:

CO1. apply programming concept to implement robotics tasks.

CO2. understand different hardware component related to robot.

CO3. learn about working of humanoid, Wheels Robots.

CO4. implement obstacle detection and avoidance problems.

CO5. know about working of Arduino/ Raspberry-pi.

CO6. implement robotics tasks using Jetson Nano.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ROBOTICS SYSTEM AND CONTROL
240504

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Introduction to ARC Software.
2. Study about the system calibration.
3. Study of Humanoid calibration parameters.
4. Study of IR sensors.
5. Study of proximity Sensor.
6. Study of communication interface of Arduino.
7. Study of Stepper motor for robotic applications.
8. Study of PWM signals.
9. Study of applications of PWM using Arduino board.
10. Study of color model in robotic applications.

List of Macro Projects:

1. Humanoid arm calibration in ARC.
2. Humanoid head calibration in ARC software.
3. Line follower characteristics in Tetrix.
4. Perform stop and run operation using Tetrix software.
5. Arduino based sensor interfacing in Tetrix.
6. Arduino based sensor controlling in Tetrix.
7. Arduino based digital sensor interfacing in Tetrix.
8. Vision sensor utility using OpenCV.

List of Mini Projects:

1. Implement a project of fast line follower robot (PID algorithm).
2. Implement a project of smart robot for face detection Recognition.
3. Implement a project of Remote Controlled robot.
4. Implement a project of Arduino based Smartphone control robot car.
5. Implement a project of color sensing Robot.
6. Implement a project of Greeting Robot.
7. Implement a project of Maze solving Robot.
8. Implement a project of Voice controlled Robot.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER GRAPHICS & MULTIMEDIA
270504/280504

LIST OF PROGRAMS

1. WAP to implement line generation using DDA algorithm.
2. WAP to implement line generation using Bresenham's line generation algorithm.
3. WAP to generate a circle using mid-point algorithm.
4. WAP to implement Bresenham's circle generation algorithm.
5. WAP to perform translation, rotation, scaling on 2D transformation.
6. WAP to perform scaling and shearing on 2D transformation.
7. WAP to implement translation of a line and triangle.
8. WAP to implement rotation of a line and triangle.
9. WAP to implement scaling transformation.
10. WAP to fill polygon using seed filling algorithm.
11. WAP to implement 3D rotation about an arbitrary axis.
12. WAP to implement Cohen Sutherland line clipping.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1. understand the basic concepts of computer graphics.

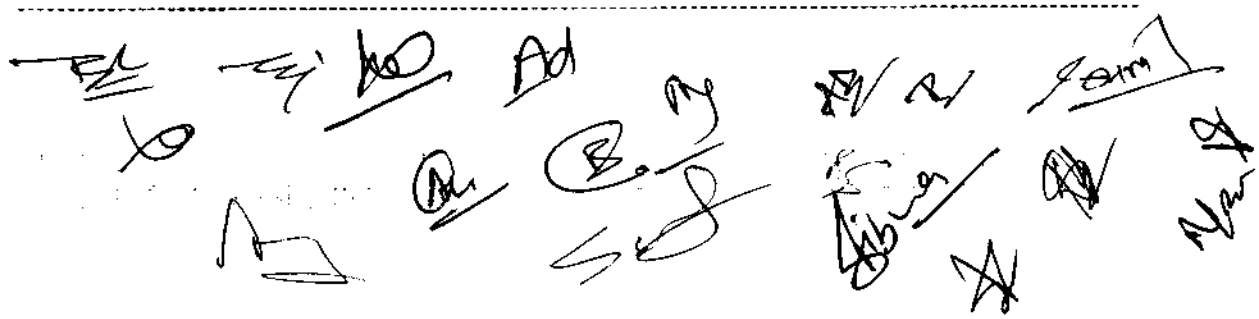
CO2. demonstrate scan conversion problems using programming language.

CO3. implement the concepts of geometric transformation of 2D and 3D objects.

CO4. apply clipping and filling techniques for modifying an object.

CO5. understand the practical implementation of modelling and rendering.

CO6. demonstrate the concept of viewing of 2D objects.



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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER GRAPHICS & MULTIMEDIA
270504/280504

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Draw the three parallel lines with different colors.
2. Draw the three lines, first should be line horizontal, second line on 45 degree and third line vertical.
3. Draw a triangle with different colors.
4. Draw a circle with multiple colors.
5. Draw two triangles with different size.
6. Draw a rectangle with 45 degree on screen.
7. Draw an ellipse on 45 degree on screen.
8. Case study on the hardware level components available in computer graphics.
9. Case study on the software level components available in computer graphics.
10. Case study on functions available in graphics.h header file.

List of Macro Projects:

1. Design an Indian Flag on screen.
2. Design a Pyramid.
3. Design a House front face.
4. Design a Balloon.
5. Design a Smile face.
6. Design a Rain.
7. Design a Football.
8. Design a Moving a wheel project.
9. Design a Moving a Cycle project.
10. Design a Analog Clock.

List of Mini Projects:

1. Write the code to draw a hut and color it using graphics.
2. Write the code to draw concentric circle on screen using graphics.
3. Write the code to draw pie-chart using graphics.
4. Write the code to make a digital clock using graphics.
5. Write the code to draw a Rainbow using graphics.

6. Write the code for moving car animation using graphics.
7. Write the code for bouncing ball animation using graphics.
8. Write the code to draw 3D bar chart on screen using graphics.
9. Write the code to draw sine wave using graphics.
10. Write the code to draw stars in night sky using graphics.

ANNEXURE - X

Scheme & Syllabi
of
B. Tech III Semester
(Batch Admitted in 2022-23)
(Information Technology/ Internet of Things (IoT)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence and Data Science/ Artificial Intelligence and Machine Learning)
Under Flexible Curriculum

[ITEM IT -13]

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Department of Information Technology

Scheme of Evaluation

B. Tech. III Semester *(Information Technology)* *(for batch admitted in academic session 2022-23)*

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted: Theory Slot: End Term Evaluation: End Sem. Exam.	Theory Slot: End Term Evaluation: $Proficiency in subject /course	Theory Slot: Continuous Evaluation: Mid Sem. Exam.	Theory Slot: Continuous Evaluation: Quiz/ Assignment	Practical Slot: End Sem. Exam.	Practical Slot: Continuous Evaluation: Lab Work & Sessional	Practical Slot: Continuous Evaluation: Skill Based Mini Project	Total Marks	Contact Hours per week: L	T	P	Total Credits	[redacted]	Mode of Exam.	Duration of Exam.
1.	2100025	BSC	Engineering Mathematics-II	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP	2 Hrs
2.	2160321	DC	Computer Networks	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
3.	2160322	DC	Design & Analysis of Algorithms	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
4.	2160323	DC	Computer Graphics & Multimedia	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
5.	2160324	DC	Operating System	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
6.	2160325	DLC	Java Programming Lab	-	-	-	-	60	20	20	100	-	1	2	2	Offline	SO	-
7.	2160326	DLC	Self-learning Presentation (SWAYAM NPTEL MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO	-
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO	-
9.	2160327	DLC	Summer Internship Project I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO	-
			Total	**250**	**50**	**100**	**100**	**290**	**100**	**60**	**950**	**10**	**06**	**14**	**23**	-	-	-
10.	3000003	Natural Sciences & Skills	Environmental Engineering	50	10	20	20	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
11.	1000001	MAC	Indian Constitution and Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching: Theory: Offline	Theory: Online	Theory: Blended	Lab: Offline	NEC	Mode of Examination: Theory: PP	Theory: AO	Theory: MCQ	Lab: SO	NEC: SO	Total Credits
03	-	12	07	01	15	-	-	07	01	23
13.04%	-	52.18%	30.43%	4.35%	65.22%	-	-	30.43%	4.35%	Credits %

DEAN (ACADEMICS)
MITS
GWALIOR

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. III Semester *(Internet of Things (IoT))* *(for batch admitted in academic session 2022-23)*

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted								Contact Hours per week			Total Credits	[redacted]	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot			Total Marks							
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation									
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project		L	T	P				
1.	2250106	BSC	Probability and Random Process	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
2.	2230321	DC	Computer Networks & Protocols	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
3.	2230322	DC	Design & Analysis of Algorithms	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
4.	2230323	DC	Computer Graphics & Multimedia	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
5.	2230324	DC	Operating System	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
6.	2230325	DLC	Design and Thinking Lab	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO	-
7.	2230326	DLC	Self-learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO	-
8.	200XXX	CLC	**Novel Engaging Course (Informal Learning)**	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO	-
9.	2230327	DLC	Summer Internship Project–I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO	-
Total				**250**	**50**	**100**	**100**	**290**	**100**	**60**	**950**	**11**	**05**	**14**	**23**	-	-	-
10.	3000003	Natural Sciences & Skills	Environmental Engineering	50	10	20	20	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
11.	1000001	MAC	Indian Constitution and Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs

$Proficiency in course/subject = includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	O	MCQ	SO	SO	
04	-	12	06	01	16	-	-	06	01	23
17.40%	-	52.17%	26.08%	4.35%	69.57%	-	-	26.08%	4.35%	Credits %

DEAN (ACADEMICS)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. III Semester *(Information Technology (Artificial Intelligence and Robotics))*

(for batch admitted in academic session 2022-23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Exam.	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation									
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project		L	T	P				
1.	2250106	BSC	Probability and Random Process	50	10	20	20	-	-	-	100	3	1	-	4		PP	2 Hrs
2.	2240321	DC	Computer Networks & Protocols	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
3.	2240322	DC	Design & Analysis of Algorithms	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
4.	2240323	DC	Computer Graphics & Multimedia	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
5.	2240324	DC	Operating System	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
6.	2240325	DLC	Design and Thinking Lab	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO	-
7.	2240326	DLC	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO	-
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO	-
9.	2240327	DLC	Summer Internship Project-I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO	-
Total				**250**	**50**	**100**	**100**	**290**	**100**	**60**	**950**	**11**	**05**	**14**	**23**	-	-	-
10.	30000003	Natural Sciences & Skills	Environmental Engineering	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ	1.5 Hrs
11.	10000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ	1.5 Hrs

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits in Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	23
04	-	12	06	01	16	-	-	06	01	Credits %
17.40%	-	52.17%	26.08%	4.35%	69.57%	-	-	26.08%	4.35%	

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Department of Information Technology

Scheme of Evaluation

B. Tech. III Semester *(Artificial Intelligence (AI) and Data Science)*

(for batch admitted in academic session 2022-23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	[illegible]	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation									
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project		L	T	P				
1.	2270321	BSC	Discrete Structures	50	10	20	20	-	-	-	100	2	1	-	3		PP	2 Hrs
2.	2270322	DC	Computer Networks & Protocols	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
3.	2270323	DC	Design & Analysis of Algorithms	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
4.	2270324	DC	Computer Graphics & Multimedia	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
5.	2270325	DC	Internet of Things	50	10	20	20	-	-	-	100	2	1	-	3	Blended	MCQ	1.5 Hrs
6.	2270326	DLC	Design and Thinking Lab	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO	-
7.	2270327	DLC	Self-learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO	-
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	[illegible]	SO	-
9.	2270328	DLC	Summer Internship Project 1 (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	[illegible]	SO	-
Total				**250**	**50**	**100**	**100**	**290**	**100**	**60**	**950**	**10**	**05**	**14**	**22**	-	-	-
10.	3000003	Natural Sciences & Skills	Environmental Engineering	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ	1.5 Hrs
11.	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ	1.5 Hrs

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
03	-	12	06	01	15	-	-	06	01	22
13.64%	-	54.55%	27.27%	4.54%	68.19%	-	-	27.27%	4.54%	

DEAN (ACADEMIC)
MITS
GWALIOR

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. III Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2022-23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	[redacted]	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2280321	BSC	Discrete Structures	50	10	20	20	-	-	-	100	2	1	-	3		PP	2 Hrs
2.	2280322	DC	Computer Networks & Protocols	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
3.	2280323	DC	Design & Analysis of Algorithms	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
4.	2280324	DC	Computer Graphics & Multimedia	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
5.	2280325	DC	Internet of Things	50	10	20	20	-	-	-	100	2	1	-	3	Blended	MCQ	1.5 Hrs
6.	2280326	DLC	Design and Thinking Lab	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO	-
7.	2280327	DLC	Self-learning Presentation (SWAYAM/NPTEL MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO	-
8.	200XXX	CLC	**Novel Engaging Course (Informal Learning)**	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO	-
9.	2280328	DLC	Summer Internship Project- I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO	-
Total				**250**	**50**	**100**	**100**	**290**	**100**	**60**	**950**	**10**	**05**	**14**	**22**	-	-	-
10.	30000003	Natural Sciences & Skills	Environmental Engineering	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ	1.5 Hrs
11.	10000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ	1.5 Hrs

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral

Mode of Teaching					Mode of Examination					
Theory			Lab	NEC	Theory			Lab	NEC	Total Credits
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
03	-	12	06	01	15	-	-	06	01	22
13.64%	-	54.55%	27.27%	4.54%	68.19%	-	-	27.27%	4.54%	Credits %

DEAN ACADEMICS

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF INFORMATION TECHNOLOGY

Syllabi
(along with the Course Outcomes)
of
B. Tech. III Semester
(Information Technology/
Internet of Things (IoT/
Artificial Intelligence and Robotics/
Artificial Intelligence and Data Science/
Artificial Intelligence and Machine Learning)
(Batch Admitted in 2022-23)
Under Flexible Curriculum

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF INFORMATION TECHNOLOGY

DISCRETE STRUCTURES
2270321/2280321

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To perceive the knowledge of basic algebra
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer engineering
- To familiarize the discrete numeric function and generating function

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Unit-I

Finite and Infinite Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Multisets, Functions and Relations, Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains, Pigeonhole Principle.

Unit-II

Prepositional Logic. Syntax, Semantics of ATF (Atomic Formula). WFF (Well Formed Formula's).Validity and Satisfiability of WFF by Quine's Method, Normal and Closure Form of Prepositional Calculus.

Unit-III

Introduction and Basic Terminology of Graphs, Planner Graphs. Multi-Graphs and Weighted Graph, Shortest Path in Weighted Graph, Introduction to Eularian Paths and Circuits, Hamiltonian Paths and Circuits, [redacted].

Unit-IV

Introduction to Discrete Numeric Functions and Generating Functions. Introduction to Recurrence Relations and Recursive Algorithms. Linear Recurrence Relations With Constant Coefficients. Homogeneous Solutions, Particular Solutions and Total Solutions.

Unit-V

Introduction to Group. Subgroups, Generations and Evaluation of Power. Cosets and Lagrange's Theorem. Group Codes. Isomorphism and Automorphism. Homomorphism and Normal Sub Groups. Ring, [redacted].

RECOMMENDED BOOKS

- J. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science. Narsingh Deo: Graph Theory.
- Kenneth Rosen: Discrete mathematics and its applications (6th edition).2006. McGraw-Hill
- C. Liu, D. Mohapatra: Elements of Discrete Mathematics. 2008. Tata McGraw-Hill.
- T. Koshy: Discrete mathematics with applications.2003. Academic Press.
- J. Hein: Discrete structures, logic and computability.2009. Jones & Bartlett Publishers.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concept of set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure.

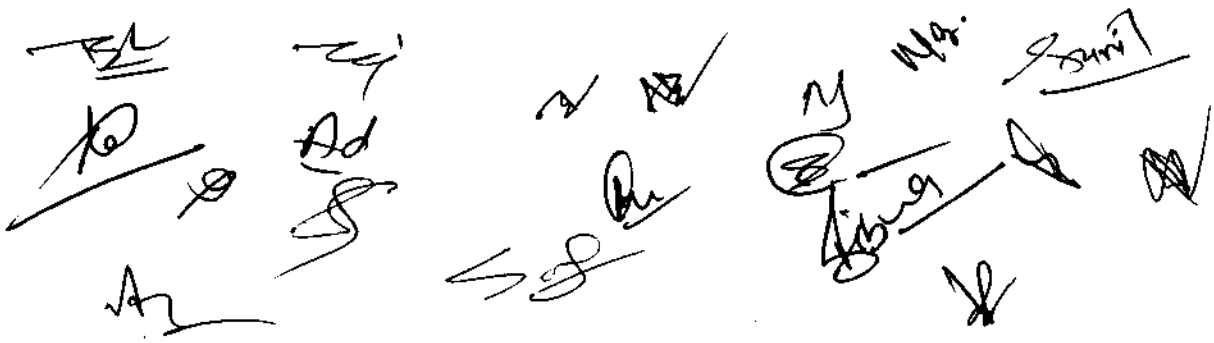
CO2. illustrate the knowledge of course content and distinguish between them in terms of their applications.

CO3. identify the concepts of graph and tree for solving problems in the computer science.

CO4. apply the concepts of studied topics with suitable technique faced in engineering problems

CO5. analyze the set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure to examine the real world problem.

CO6. build analytical skill and interpret applications of engineering beneficial in real time troubleshooting.



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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER NETWORKS
2160321

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable Students to deal with various networking problems such as flow control, error control and congestion control.

Unit-I

Introduction: Computer Network, Types- LAN, MAN & WAN, Data Transmission Modes- Serial & Parallel, Simplex, Half Duplex & Full Duplex, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided, Cables- Twisted Pair, Coaxial Cable & Optical Fiber, Networking Devices-Repeaters, Hub, Switch, Bridge, Router, Gateway and Modem, Performance Criteria- Bandwidth, Throughput, Propagation Time & Transmission Time, Network Standardization- OSI Reference Model & TCP/IP Reference Mode, X.25.

Unit-II

Physical Layer: Network Topologies- Bus, Ring, Star & Mesh, Line Coding- Unipolar, Polar and Bipolar, Switching- Circuit Switching, Message Switching & Packet Switching, Multiplexing: FDM – Frequency Division Multiplexing, WDM – Wavelength Division Multiplexing & TDM – Time Division Multiplexing.

Unit-III

Data Link Layer: Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- The Channel Allocation Problem, Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit-IV

Network Layer & Transport Layer: Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd--Warshall's Algorithm, Flooding, Congestion Control- Open Loop & Closed Loop Congestion Control, Leaky Bucket & Token Bucket Algorithm. Connection Oriented & Connectionless Service, IP Addressing.

Unit-V

Presentation, Session& Application Layer: Introduction, Design Issues, Presentation Layer- Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer- Remote Login, File Transfer & Electronic Mail.

RECOMMENDED BOOKS

- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the fundamental concepts of computer network.

CO2. illustrate the basic taxonomy & terminologies of computer network.

CO3. identify various parameter for affecting the performance of computer network.

CO4. analyze the concepts of communication using various layer of OSI model.

CO5. evaluate the performance of computer network in congestion and Internet.

CO6. design the network environment and applications for implementation of computer networking concept.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER NETWORKS AND PROTOCOLS
2230321/2240321/2270322/2280322

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking & Protocols.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable students to deal with various networking problems such as flow control, error control and congestion control.

Unit-I

Introduction: Computer Network Types, OSI Reference Model & TCP/IP Reference Mode, Circuit Switching, Message Switching & Packet Switching, Frequency Division Multiplexing, Wavelength Division Multiplexing & Time Division Multiplexing, ISDN, SONET.

Physical Layer : Data Transmission Modes, Network topologies, Line Coding, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided. Networking Devices, Performance Criteria.

Unit-II

Data Link Layer: Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- Channel Allocation Problem, Pure ALOHA ,Slotted ALOHA, CSMA ,CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5, HDLC.

Unit-III

Network Layer Protocols: Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Routing Protocols, Flooding, Connection Oriented & Connectionless Service, IP Addressing, IPV4, IPV6, Internet Protocol Datagram, Fragmentation, ICMP, IGMP.

Unit-IV

Transport Layer Protocols: Datagram Protocol (UDP) - Process To Process Communication, Port Number, Socket Address, User Datagram, UDP Operation. TCP Services, Process To Process Communication, Stream Delivery Service, Full Duplex Communication, Connection Oriented Service, Reliable Service, TCP Features-Numbering System, Flow Control, Error Control, Congestion Control , TCP Segment, Flow Control-Sliding Window Protocol, Silly Window Syndrome Error Control-Checksum, Acknowledgement, Retransmission, Congestion Control.

Unit-V

Application Layer Protocols: Introduction, Design Issues, Presentation Layer-Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer-Remote Login, File Transfer & Electronic Mail. Domain Name System (DNS), Telnet, FTP, TFTP, Email Protocol: SMTP, POP, IMAP.

RECOMMENDED BOOKS

- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.
- TCP/IP Protocol Suite, B. A. Fourozan, Tata McGraw Hill
- Internetworking with TCP/IP, Douglas E. Comer, Publisher- PHI, New Delhi
- TCP/IP Illustrated by Richard Stevens, Publisher- Addison – Wesley.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

CO1. explain the fundamental concepts of computer network.

CO2. illustrate the basic taxonomy & terminologies of computer network protocols.

CO3. develop a concept for understanding advance computer network.

CO4. build the skill of IP addressing and routing mechanism.

CO5. predict the performance of computer network in congestion and internet.

CO6. construct the network environment for implementation of computer networking concept.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN & ANALYSIS OF ALGORITHMS
2160322/2230322/2240322/2270323/2280323

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To introduce the topic of algorithms as a precise mathematical concept.
- To study the techniques like recursion, divide and conquer, dynamic programming, greedy approach, backtracking and branch and bound.
- To practice their skills on many well-known algorithms and data structures designed to solve real-life problems.

Unit-I

Introduction to Computational Model: Algorithms and its Importance, Recurrences and Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithm, Review of Sorting & Searching Algorithms, **Basic Tree and Graph Concepts:** B-Trees and Traversal Techniques, Topological sort.

Unit-II

Divide and Conquer Method: Introduction and its Examples such as Finding the Maximum and Minimum, Binary Search, Merge Sort, Quick Sort and Strassen's Matrix Multiplication and Additional Real World Problems on Divide and Conquer.

Unit-III

Greedy Method: Introduction. Characteristics. Examples of Greedy Methods such as Single-Source Shortest Paths. **Minimum Cost Spanning Trees** : Prims's and Kruskal's Algorithm. Knapsack Problem, Dijkstra's Single Source Shortest Path Algorithm. Optimal Storage on Tapes.

Unit-IV

Dynamic Programming: Introduction, The Principle of Optimality, Examples of Dynamic Programming Methods such as – 0/1 Knapsack. Traveling Salesman Problem, Floyd's All Pairs Shortest Path. Longest Common Subsequence and Reliability Design. Matrix Chain Multiplication.

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Unit-V

Backtracking: Concept and its Examples like 4-Queen's Problem, Knapsack problem Hamiltonian Circuit Problem, Graph Coloring Problem etc. **Branch & Bound:** Introduction and its Examples like - Traveling Salesperson Problem etc. **NP-Completeness:** Introduction, Class P and NP, Polynomial Reduction, NP-Hard and NP-Complete Problems.

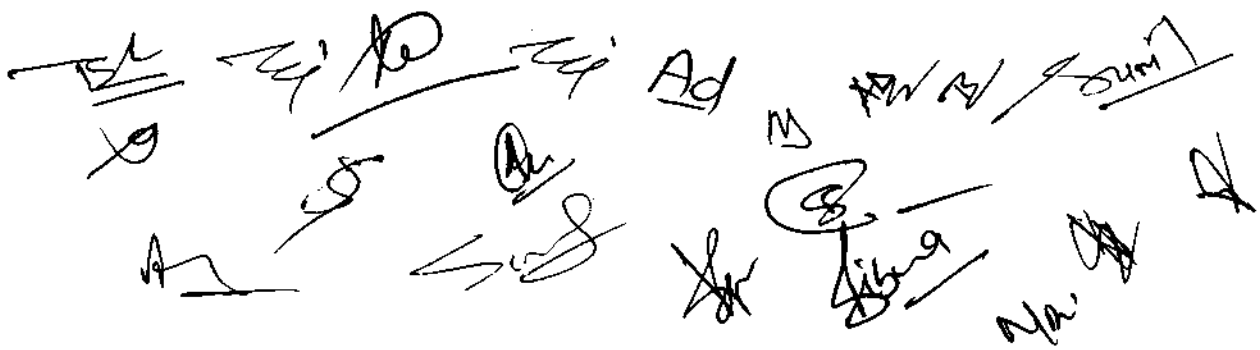
RECOMMENDED BOOKS

- Fundamentals of Computer Algorithms, Horowitz & Sahani, Universities press.
- Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.
- Design & Analysis of Computer Algorithms, Ullmann, Pearson.
- Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. demonstrate a familiarity with major algorithms and data structures.
CO2. idenify important algorithmic design paradigms and methods of analysis.
CO3. analyze the performance of algorithms.
CO4. compare various algorithm design techniques.
CO5. select the design technique to solve any real world problem.
CO6. design efficient algorithm using various design techniques.



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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER GRAPHICS & MULTIMEDIA
2160323/2230323/2240323/2270324/2280324

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To become familiar with computer graphics techniques and display devices.
- To enhance the proficiency in image representations, 2D and 3D graphics transformations.
- To develop awareness with various illumination, color models and multimedia system.

Unit-I

Introduction to Computer Graphics: Interactive Computer Graphics, Application of Computer Graphics, Random and Raster Scan Displays, Storage Tube Graphics Display, Calligraphic Refresh Graphics Display, Flat Panel Display, Refreshing, Flickering, Interlacing, Resolution, Bit Depth, Aspect Ratio etc.

Unit-II

Scan Conversion Technique: Image representation. Line drawing: DDA, Bresenham's Algorithm. Circle Drawing: Mid-Point, DDA, Bresenham's Circle Generation Algorithm. Ellipse Generation Algorithm. Curves: Parametric Function, Bezier Method, B-Spline Method.

Unit-III

2D & 3D Transformations: Translation. Rotation. Scaling, Reflection, Shearing, Inverse Transformation. Composite Transformation. World Coordinate System. Viewing Transformation. Representation of 3D object on Screen. Parallel and Perspective Projections.

Unit-IV

Clipping: Point clipping, Line Clipping. Simple Visibility Line Clipping Algorithm, Polygon Clipping, Hidden Surface Elimination: Z- Buffer algorithm and Painter's Algorithm. Area Filling, **Basic Illumination Models:** Diffuse Reflection, Specular Reflection. Phong Shading. Gouraud Shading. Color Models: RGB, YIQ, CMY. HSV.

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Unit-V

Multimedia System: An Introduction, Multimedia hardware and software, Multimedia System Architecture, Multimedia Applications and evolving technologies, Multimedia Authoring. Data & File Format standards, Sampling, Compression standards, Compression through spatial and temporal redundancy.

RECOMMENDED BOOKS

- Donald Hearn and M.P. Becker : Computer Graphics, PHI Publication
- FoleyVandam, Feiner, Hughes : Computer Graphics principle and Practice
- Rogers : Principles of Computers Graphics, TMH
- Sinha and Udai : Computer Graphics, TMH
- Prabhat K. Andleigh, Kiran Thakrar : Multimedia Systems Design, Prentice Hall PTR

COURSE OUTCOMES

After completion of the course students will be able to:

CO1. explore various display devices and applications of computer graphics.

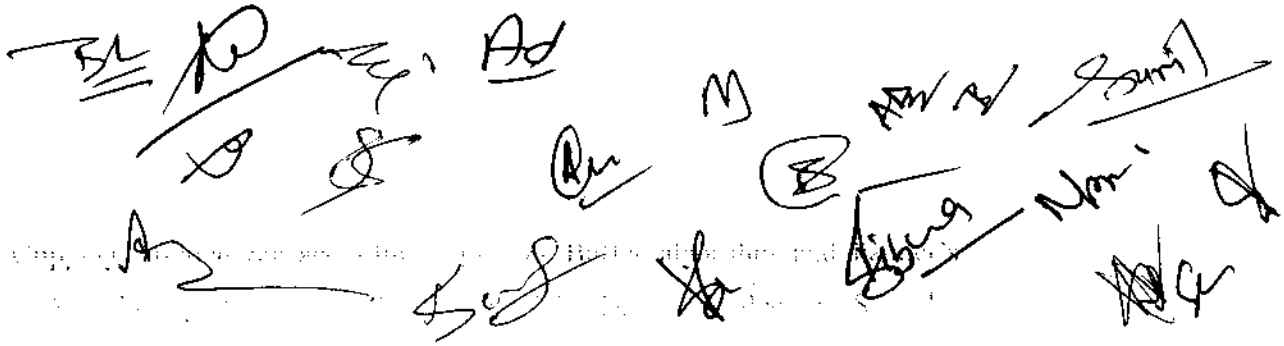
CO2. illustrate various scan conversion techniques like line, circle, curve and shape drawing algorithms.

CO3. apply 2-dimensional, 3-dimensional transformations and projections on images.

CO4. classify methods of image clipping and various algorithms for line and polygon clipping.

CO5. apply appropriate filling algorithms, hidden surface elimination algorithm on images.

CO6. summarize various color models, shading methods and multimedia system.



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DEPARTMENT OF INFORMATION TECHNOLOGY

OPERATING SYSTEM
2160324/2230324/2240324

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

Unit I

Basics of Operating System: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Unit II

Process Management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

Unit III

Process Synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Unit IV

Memory Management: Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit V

Storage Management: Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

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File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

RECOMMENDED BOOKS

- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

CO1. tell the basic concept of operating systems.

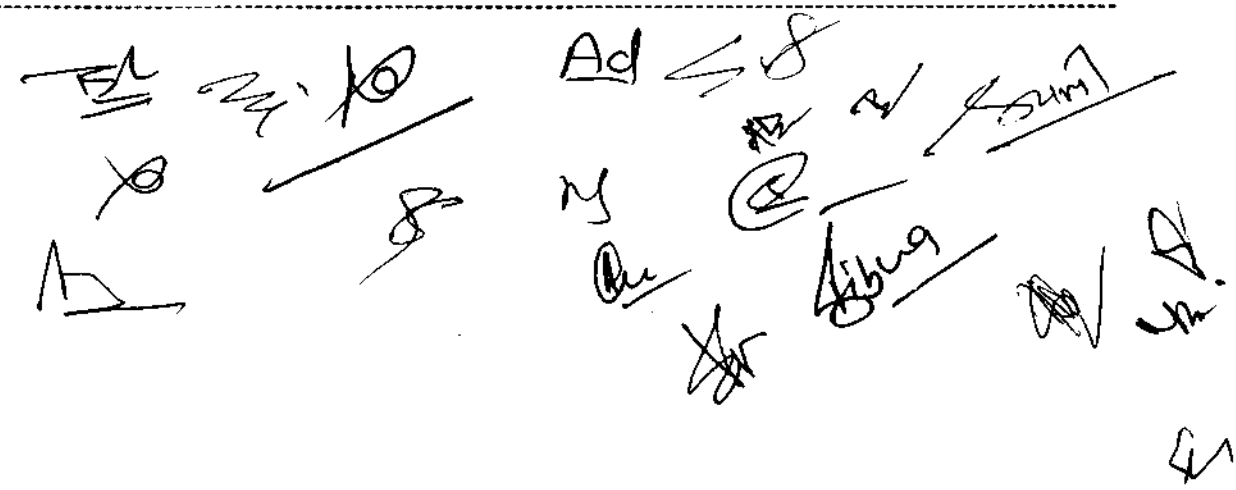
CO2. explain the working procedure of the operating system.

CO3. analyze the various operating system problems and issues.

CO4. develop the solutions for various operating system problems and issues.

CO5. measure the performance of various scheduling and allocation techniques.

CO6. test the working of various scheduling and allocation techniques.



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DEPARTMENT OF INFORMATION TECHNOLOGY

INTERNET OF THINGS
2270325/2280325

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To understand basic terminology, concepts, structure and flow of IoT.
- To understand protocols of IoT.
- To understand Sensors, Devices & Components.
- To be able to understand the security issues in IoT.

UNIT I

Introduction to IoT and network architecture: Evolution of Internet of Things (IoT), IoT Components, Impact of IoT. IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture: Core IoT Functional Stack, IoT data management and compute stack (Cloud, edge, fog).

UNIT II

IoT Protocols: Communication Protocols: IEEE 802.15.4, Zigbee, 6LoWPAN, Z-Wave, Bluetooth, RFID. Networking Protocols: CoAP and MQTT.

UNIT III

Things in IoT: Sensor: light sensor, moisture sensor, temperature sensor, etc. Actuator: DC motor, different types of actuators. Controllers: microcontrollers and their role as a gateway to interfacing sensors and actuators.

IoT Platform overview: Raspberry pi, Arduino Board details, Introduction to Arduino IDE, Embedded 'C' Language basics, Interfacing sensors, LEDs.

UNIT IV

Cloud computing in IoT: Introduction to Cloud Computing-Definition, Characteristics, Components, Cloud provider: Microsoft Azure, AWS, Google Cloud.

UNIT V

Security and Future of IoT ecosystem: Need of security in IoT, Privacy for IoT enabled devices, IoT security for consumer devices, Security levels, protecting IoT

devices Future IoT eco system, Need of power full core for building secure algorithms, Examples for new trends – AI, ML penetration to IoT

RECOMMENDED BOOKS

- IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
- Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
- Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill HigherEducation.

COURSE OUTCOMES

After completion of this course, the students would be able to:

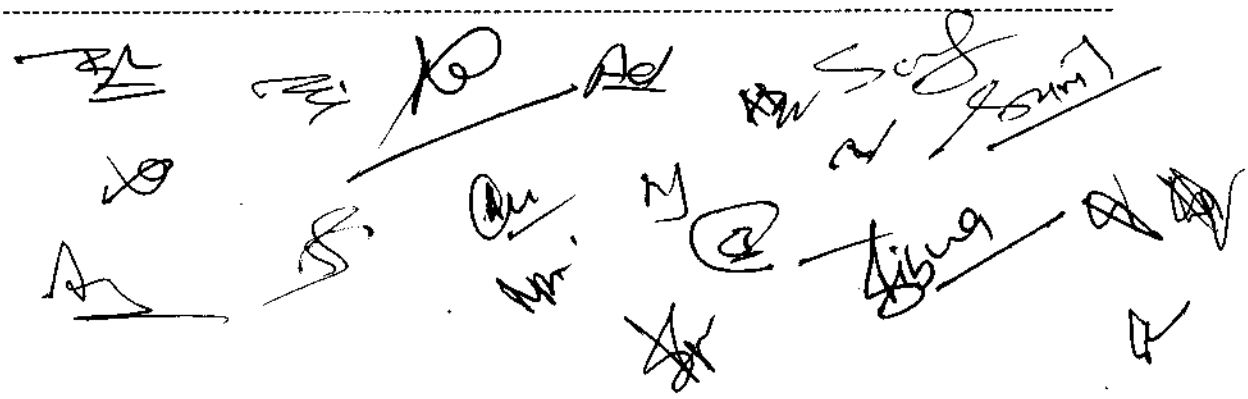
CO1. develop basic understanding of IoT and its architecture.

CO2. compare the communication models and protocols for IoT.

CO3. analyze different devices, hardware and software platforms for application in IoT.

CO4. discuss the security issues involved in IoT.

CO5. develop IoT Applications in real world.



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DEPARTMENT OF INFORMATION TECHNOLOGY

JAVA PROGRAMMING LAB
2160325

L	T	P	Total Credits
-	1	2	2

COURSE OBJECTIVES

- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To acquire the ability to write a computer program to solve specified problems.
- To be able to use Java SDK environment to create, debug and run simple Java programs.

Unit-I

Introduction to Java programming: Overview and Characteristics of Java, The Java Virtual Machine, Installing Java, Java Program Development, Java Source File Structure, Compilation, Executions. Packages, Package access, Variables and data types, Conditional and looping constructs, Arrays.

Unit-II

Object-oriented programming with Java Classes and Objects: Fields and Methods. Constructors, Overloading methods, Nested classes, Overriding methods, Polymorphism, Making methods and classes final. Wrapper classes.

Unit-III

Extending Classes and Inheritance: Types of Inheritance in Java, Abstract classes and methods, Interfaces, use of 'super'. Polymorphism in inheritance. Garbage collection in JAVA.

Exception handling: Try- Catch. Throw. Throws. Finally constructs. The Exception class.

Unit-IV

String Package and Multithreading: Operation on String, Mutable & Immutable String, Tokenizing a String. Creating Strings using String Buffer class.

Understanding Threads: Needs of Multi-Threaded Programming, Thread Life-Cycle. Thread Priorities and Synchronizing Threads.

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Unit-V

The I/O Package: Input Stream and Output Stream classes, Reader and Writer classes, Basics of AWT, Swing and Applets: Layout Managers, Event Handling, Classes for various controls, such as label, choice, list, checkbox, etc., Dialogs and frames using menus.

Basic concepts of networking: Working with URLs, Concepts of URLs and Sockets. Basics of database connectivity with JDBC.

RECOMMENDED BOOKS

- Programming with JAVA: A Primer, E. Balagurusamy, Tata McGraw Hill.
- JAVA: The Complete Reference, Herbert Schildt, McGraw Hill Education.
- JAVA-2: The Complete Reference, Patrick Naughton, Herbert Schidt.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. tell the available features in Java programming language.

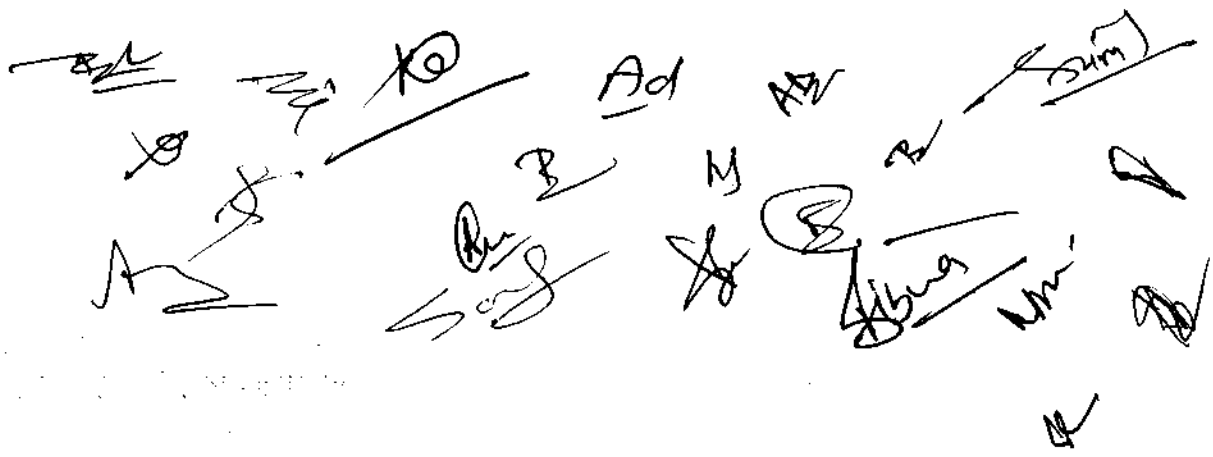
CO2. illustrate Java programming concepts for solving problems.

CO3. make use of the Java programming methods for connecting the various databases.

CO4. test for bugs in a software application written in the Java programming language.

CO5. determine different ways for handling exceptions. memory management, file handling. i/o management and internet based application development.

CO6. build a project for application development using Java programming language.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN AND THINKING LAB
2230325/2240325/2270326/2280326

L	T	P	Total Credits
-	-	2	1

PREREQUISITES

We assume that you are already familiar with the basics of C and C++. Knowledge in other programming language especially the OOP is an added advantage. A basic understanding of microcontrollers and electronics is also expected.

COURSE OBJECTIVE:

The students will:

- Learn the basics of electronics, including reading schematics (electronics diagrams)
- Learn how to prototype circuits with a breadboard
- Learn the Arduino programming language and IDE
- Program basic Arduino examples
- Prototype circuits and connect them to the Arduino
- Program the Arduino microcontroller to make the circuits work
- Connect the Arduino microcontroller to a serial terminal to understand communication and stand-alone use
- Explore the provided example code and online resources for extending knowledge about the capabilities of the Arduino microcontroller

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Unit-I

Introduction: embedded system, Understanding Embedded System, Overview of basic electronics and Digital electronics, Microprocessor vs Microcontroller, Common features of Microcontroller, Comparison between different types of microcontrollers.

Unit-II

Arduino: introduction, Pin Configuration and Architecture, Device and Platform Features, Concept of Digital and Analog ports, Arduino Interfacing Board, Introduction to Embedded C and Arduino Platform.

Unit-III

Basic Concepts and Functions: Arduino data types, Variables and constants, Operators, Control Statements, Arrays, Functions, Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT, pinMode() Function, digitalWrite() Function, analogRead() function, Arduino Interrupts.

Unit-IV

Arduino Time and Displays: Incorporating Arduino time, delay() function, delay Microseconds() function, millis() function, micros() function. Working with Serial Monitor, Line graph via serial monitor, interfacing 8 bit LCD to Arduino, Fixed one line static message display, Running message display using the LCD Library of Arduino.

Unit-V

Arduino Sensors and Secondary Integrations: Humidity Sensor, Temperature Sensor, Water Detector/ Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switch (Relay switches). Types of Relay, Controlling Electrical appliances with electromagnetic relays.

RECOMMENDED BOOKS:

- Arduino for Dummies, by John Nussey (2013)

References:

1. Arduino Projects for Dummies, by Brock Craft (2013)
2. Programming Arduino – Getting Started with Sketches, Simon Monk (2016)
3. Programming Arduino - Next Steps, by Simon Monk (2016)

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the basic concept of Embedded System.

CO2. describe the basic principles of Arduino programming and IDE.

CO3. familiarize with different types of sensors and related systems.

CO4. design, implement, debug and test programs/ system.

CO5. design and develop Smart systems applications.

CO6. build Arduino board using different sensors.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - XI

List of Experiments and Skill Based Mini Project for Laboratory Courses B.Tech III Semester (Batches admitted in 2022-23) (Information Technology/ Internet of Things (IoT/ Artificial Intelligence and Robotics/ Artificial Intelligence and Data Science/ Artificial Intelligence and Machine Learning) Under Flexible Curriculum

[ITEM IT - 14]

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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN & ANALYSIS OF ALGORITHMS
2160322/2230322/2240322/2270323/2280323

LIST OF PROGRAMS

1. WAP to implement the following using array as data structure and analyze its time complexity.
   a. Insertion sort b. Selection sort c. Bubble sort d. Quick sort
   e. Merge sort f. Heap sort
2. WAP to implement Linear and Binary Search and analyze its time complexity.
3. WAP to implement Strassen's Matrix Multiplication.
4. WAP to implement Binomial coefficient computation and analyze its time complexity.
5. WAP to implement minimum spanning tree using Prim's algorithm and analyze its time complexity.
6. WAP to implement Dijkstra's Algorithm and analyze its time complexity.
7. WAP to implement Bellman Ford Algorithm and analyze its time complexity.
8. WAP to implement DFS and BFS and analyze their time complexities.
9. WAP to implement Bucket Sort Algorithm for integer elements.
10. WAP to implement Topological sort algorithm and analyze their time complexities.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. relate the principles of algorithm design in solving problems.

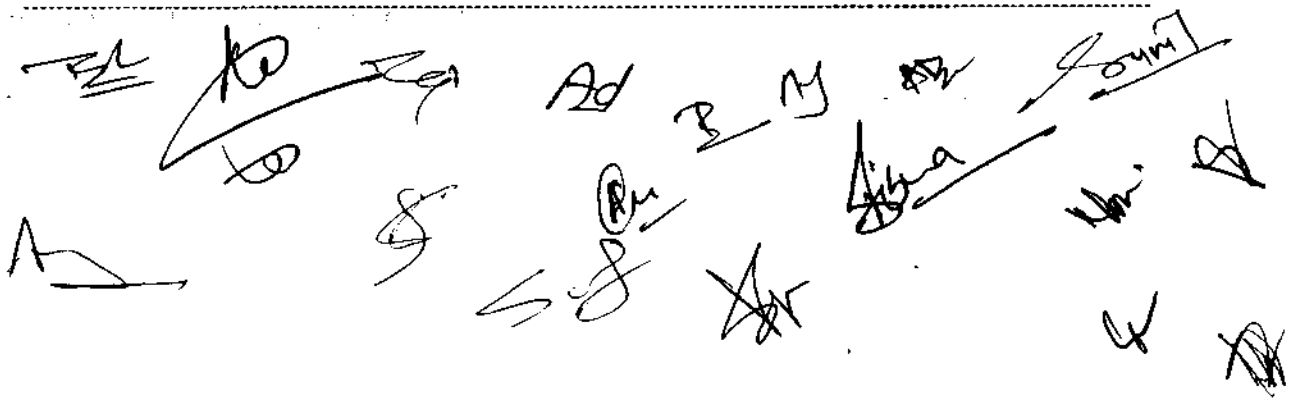
CO2. demonstrate basic algorithms and different problem solving strategies.

CO3. build creativeness and confidence to solve non-conventional problems.

CO4. analyze running times of algorithms using asymptotic analysis.

CO5. compare various algorithm design approaches for solving real world problems.

CO6. design and implement optimization algorithms in specific applications.



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DESIGN & ANALYSIS OF ALGORITHMS
2160322/2230322/2240322/2270323/2280323
LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

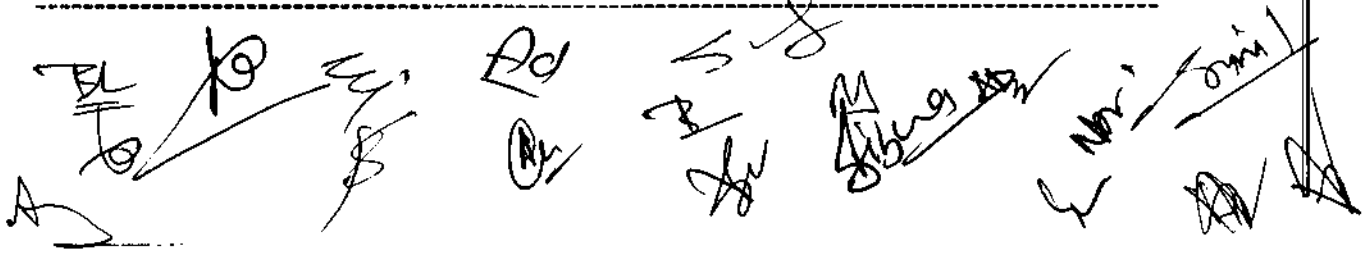
1. Implement the greedy approach for single source shortest path.
2. Design a program for finding minimum cost tree for traversing all nodes of a graph.
3. Implement tree traversal techniques like pre-order, post-order and in-order.
4. Implement the Task Scheduling problem.
5. Implement the Longest Common Subsequence problem.
6. Find the shortest cycle in a graph.

List of Macro Projects:

1. Implement the movement of knight in chess game.
2. Implementation of a guessing game of the terminal on screen.
3. Print all the nodes reachable from a given starting node in a digraph using BFS method.
4. Check whether a given graph is connected or not using DFS method.
5. Find a subset of a given set S = {s1.s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1.2.6} and {1.8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.
6. Write a program to solve the job scheduling problem using the greedy algorithm.
7. Calculate the maximum weighted vertex pair in the weighted graph.

List of Mini Projects:

1. Implement a program for matrix layer rotation.
2. Implementation of vertex cover algorithm.
3. Implementation of the knapsack problem.
4. Implement N Queen's problem using Back Tracking.
5. Write a program to calculate the shortest path using travelling salesman problem.
6. Implement a phone directory application using doubly-linked lists.
7. Find the maximum clique in a graph.
8. WAP to implement the spanning tree using kruskal algorithms.



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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER GRAPHICS & MULTIMEDIA
2160323/2230323/2240323/2270324/2280324

LIST OF PROGRAMS

1. WAP to implement line generation using DDA algorithm.
2. WAP to implement line generation using Bresenham's line generation algorithm.
3. WAP to generate a circle using mid-point algorithm.
4. WAP to implement Bresenham's circle generation algorithm.
5. WAP to perform translation, rotation, scaling on 2D transformation.
6. WAP to perform scaling and shearing on 2D transformation.
7. WAP to implement translation of a line and triangle.
8. WAP to implement rotation of a line and triangle.
9. WAP to implement scaling transformation.
10. WAP to fill polygon using seed filling algorithm.
11. WAP to implement 3D rotation about an arbitrary axis.
12. WAP to implement Cohen Sutherland line clipping.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1. understand the basic concepts of computer graphics.

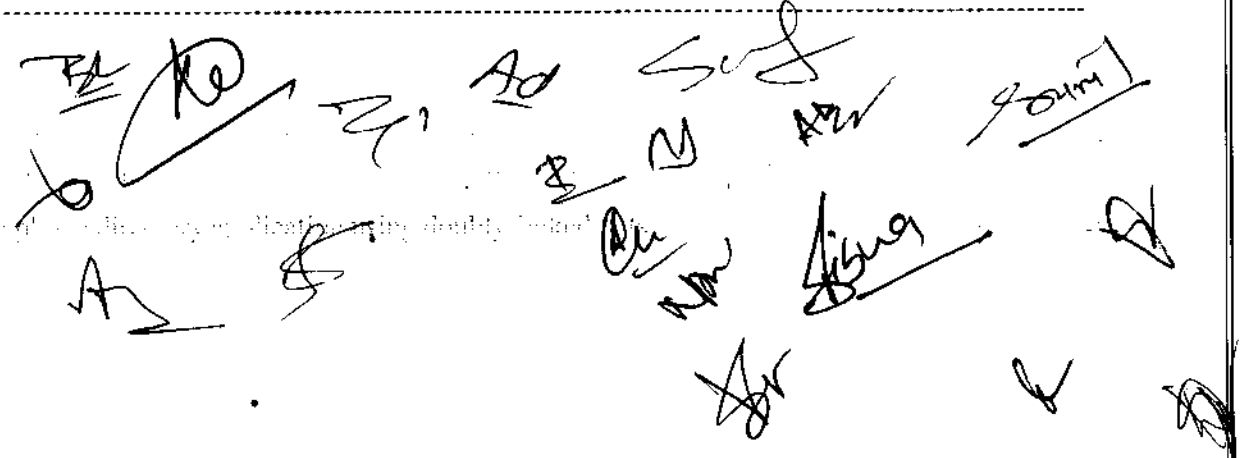
CO2. demonstrate scan conversion problems using programming language.

CO3. implement the concepts of geometric transformation of 2D and 3D objects.

CO4. apply clipping and filling techniques for modifying an object.

CO5. understand the practical implementation of modelling and rendering.

CO6. demonstrate the concept of viewing of 2D objects.



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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER GRAPHICS & MULTIMEDIA
2160323/2230323/2240323/2270324/2280324

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Draw the three parallel lines with different colors.
2. Draw the three lines, first should be line horizontal, second line on 45 degree and third line vertical.
3. Draw a triangle with different colors.
4. Draw a circle with multiple colors.
5. Draw two triangles with different size.
6. Draw a rectangle with 45 degree on screen.
7. Draw an ellipse on 45 degree on screen.
8. Case study on the hardware level components available in computer graphics.
9. Case study on the software level components available in computer graphics.
10. Case study on functions available in graphics.h header file.

List of Macro Projects:

1. Design an Indian Flag on screen.
2. Design a Pyramid.
3. Design a House front face.
4. Design a Balloon.
5. Design a Smile face.
6. Design a Rain.
7. Design a Football.
8. Design a Moving a wheel project.
9. Design a Moving a Cycle project.
10. Design a Analog Clock.

List of Mini Projects:

1. Write the code to draw a hut and color it using graphics.
2. Write the code to draw concentric circle on screen using graphics.
3. Write the code to draw pie-chart using graphics.
4. Write the code to make a digital clock using graphics.
5. Write the code to draw a Rainbow using graphics.

6. Write the code for moving car animation using graphics.
7. Write the code for bouncing ball animation using graphics.
8. Write the code to draw 3D bar chart on screen using graphics.
9. Write the code to draw sine wave using graphics.
10. Write the code to draw stars in night sky using graphics.

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JAVA PROGRAMMING LAB
2160325

LIST OF PROGRAMS

1. Write a program to accept two numbers (int) as command line arguments and print their Sum.
2. Write a program to find the average and sum of the N numbers Using Command line argument.
3. Write a program to Demonstrate Type Casting.
4. Write a program to find the number of arguments provide at runtime.
5. Write a program to print Fibonacci series without using recursion and using recursion.
6. Write a program to check prime numbers and palindrome numbers.
7. Write a program to sort an array of elements using bubble sort algorithm.
8. Write a program to sort an array of elements using insertion sort algorithm.
9. Write a non-static function in java that prints the sum of two numbers.
10. Create an abstract class Shape which has a field PI=3.14 as final and it has an abstract method Volume. Make two subclasses Cone and Sphere from this class and they print their volume.
11. WAP to handle the Exception using try and multiple catch block.
12. 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 divide by zero.
13. Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text field when the button "Compute" is clicked
14. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every first 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.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. tell the available features in Java programming language.

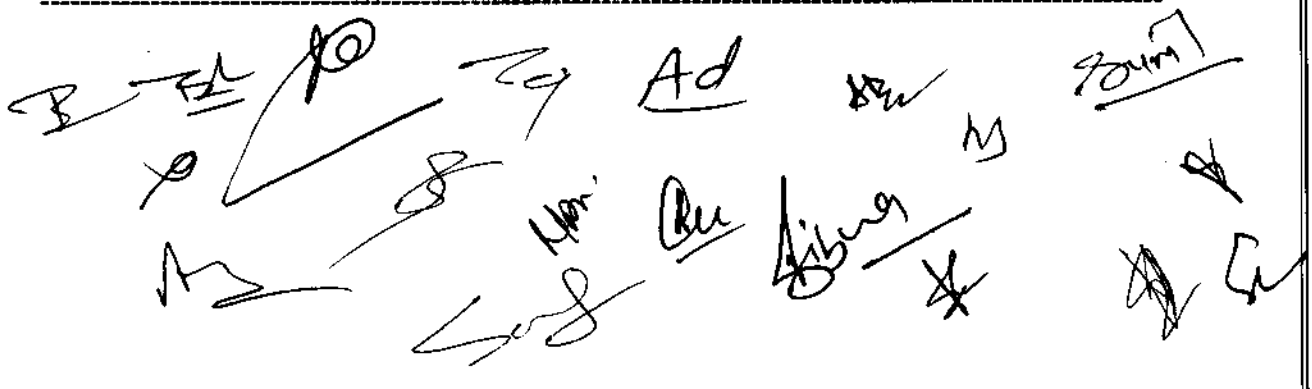
CO2 illustrate Java programming concepts for solving problems.

CO3. make use of the Java programming methods for connecting the various databases.

CO4. test for bugs in a software application written in the Java programming language.

CO5. determine different ways for handling exceptions, memory management, file handling, i/o management and internet based application development.

CO6. build a project for application development using Java programming language.



MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF INFORMATION TECHNOLOGY

JAVA PROGRAMMING LAB
2160325

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. To build an Authentication System for user login.
2. Design a Random number generator using function.
3. Calculate the CGPA of students using java application.
4. Implementation of Word Counter using java programming language.
5. Convert the temperature in different slandered using java.
6. To manage the data of alumni using Online Alumni Database System.
7. Design a Ceaser Cipher for encryption and decryption of text.

List of Macro Projects:

1. Implementation of Online shopping bill generation system using java programming language.
2. Design a Scientific Calculator using event delegation model of java.
3. To mange Online Quiz using java application.
4. Build an application for designing CV/ Resume
5. Calculate the Electricity Bill using java programming language.
6. Design a Online Voting System using multithreading concept of java.
7. To implement the Playfair Cipher concept using java programming language.

List of Mini Projects:

1. Develop a java application for implementation of Online Shopping Cart.
2. Apply the basic concept of java applet for designing Tic-Tac-Toe Game.
3. Create a Java application for implement basic transaction in any Bank.
4. To manage the attendance of students using Java database Management System
5. To implement a Java application for conduction of Online survey System
6. Design a Java application for designing Search Engine
7. Create a Java application for development of Snake Game.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN AND THINKING LAB
2230325/2240325/2270326/2280326

LIST OF PROGRAMS

1. Introduction to Arduino Board and Arduino IDE (Installation and Setup)
2. Write a Program to Blink LED (Turn an LED on and off).
3. Write a Program to demonstrate the use of analog output to fade an LED.
4. Write a Program to read an analog input and prints the voltage to the serial monitor.
5. Write a Program to count the number of button pushes.
6. Write a Program to Control an LED using Button.
7. Write a program to detect object using IR Obstacle Sensor.
8. Write a program to detect presence of Gas using GAS Sensor.
9. Write a Program to Control Electronic Appliances using RELAY SHIELD Sensor.
10. Write a Program to measure Temperature and Humidity using DHT11 Sensor.
11. Write a program to detect motion using Motion Sensor (PIR sensor).
12. Write a Program to detect presence of smoke using Smoke Sensor.
13. Write a Program to play melody with a Piezo speaker.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the basic concept of Embedded System.

CO2. describe the basic principles of Arduino programming and IDE.

CO3. familiarize with different types of sensors and related systems.

CO4. design, implement, debug and test programs/ system.

CO5. design and develop Smart systems applications.

CO6. build Arduino board using different sensors.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN AND THINKING LAB
2230325/2240325/2270326/2280326

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Develop a fire detection system with Arduino using the flame sensor.
2. Implement a Traffic light system with multiple-coloured LEDs
3. Design a Gas detection system using gas sensors
4. Design a system with Arduino and Humidity sensor to measure the humidity in your surroundings
5. Use an ultrasonic sensor to measure the distance from the target.
6. Measure the intensity of light using a light detection resistor (LDR) and indicate the level of change in intensity using an LED.
7. Detect an object using Arduino with the help of an infrared sensor.

List of Macro Projects:

1. Monitor the quality of air quality using suitable sensors.
2. Develop an RFID system to read the information of an RFID tag and display the information on the Serial monitor
3. Use the data received from a temperature sensor to control a DC motor
4. Indicate the object detection from the ultrasonic sensor with the help of an LED.
5. Sound pollution monitoring
6. Control the direction of a stepper motor by programming the Arduino.
7. Develop a system to dim the intensity of light of an LED or Light bulb as the natural light intensity increases in the surroundings.

List of Mini Projects:

1. Develop an automatic traffic management system using different sensors.
2. Develop an automatic irrigation system with the help of different sensors and actuators
3. Develop an automatic gun firing system using different sensors and actuators.
4. Develop a radar sensing system
5. Develop a voice control bot using different sensors and actuators.
6. Develop a smart billing system using RFID tags
7. Develop a smart dustbin using different sensors and actuators.
8. Develop an intelligent home locking system using different sensors and actuators.

9. Develop an intelligent water level management system.
10. Develop home automation system using different sensors and actuators.
11. Develop a real time clock-based home automation.

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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - XII

Scheme & Syllabi
of
B. Tech I & II Semester
(Batch Admitted in 2023-24)
(Information Technology/ Internet of Things (IoT)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence and Data Science/ Artificial Intelligence and Machine Learning)
Under Flexible Curriculum

[ITEM IT -16]

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. I Semester *(Information Technology)*

(for batch admitted in academic session 2023-24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	3160121	**DC**	Introduction to Information Technology	50	10	20	20	-	-	-	100	4	-	-	4	Blended	MCQ	1.5 Hrs
2.	3160122	**DC**	Computer Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	3160123	**DC**	Digital Logic Design	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	3160124	**DC**	Discrete Structures	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP	2 Hrs
5.	3100022	**ESC**	Basic Electrical & Electronics Engineering	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
6.	3160125	**DLC**	IT workshop	-	-	-	-	40	30	30	100	-	-	2	1	Offline	SO	-
Total				**250**	**50**	**100**	**100**	**120**	**90**	**90**	**800**	**12**	**04**	**06**	**19**	**-**	**-**	**-**
7.	3000001	**Natural Sciences & Skills**	Engineering Physics	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
03	-	13	03	09	03	04	03	19
15.79%	-	68.42%	15.79%	47.37%	15.79%	21.05%	15.79%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. II Semester *(Information Technology)*

(for batch admitted in academic session 2023-24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	3160221	DC	Data Structures	50	10	20	20	40	30	30	200	3	-	2	4	Blended	PP	2 Hrs
2.	3160222	DC	Python Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	3160223	DC	Database Management System	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
4.	3160224	DC	Computer System Organization	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
5.	3100011	BSC	Engineering Mathematics-I	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
Total				**250**	**50**	**100**	**100**	**120**	**90**	**90**	**800**	**12**	**04**	**06**	**19**	**-**	**-**	**-**
6.	3000002	Natural Sciences & Skills	Engineering Chemistry	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
Summer Internship Project – I (Institute Level) (Qualifier): Minimum two-week duration: Evaluation in III Semester.																		

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
04	-	12	03	13	03	-	03	19
21.05%	-	63.16%	15.79%	68.42%	15.79%		15.79%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. I Semester *(Internet of Things (IoT))*

(for batch admitted in academic session 2023-24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	3230121	DC	Introduction to Internet of Things (IoT)	50	10	20	20	-	-	-	100	4	-	-	4	Blended	MCQ	1.5 Hrs
2.	3230122	DC	Computer Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	3230123	DC	Digital Logic Design	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	3250100	BSC	Linear Algebra	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
5.	3100022	ESC	Basic Electrical & Electronics Engineering	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
Total				**250**	**50**	**100**	**100**	**80**	**60**	**60**	**700**	**13**	**04**	**04**	**19**	**-**	**-**	**-**
6.	3000001	Natural Sciences & Skills	Engineering Physics	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
04	-	13	02	10	03	04	02	19
21.05%	-	68.42%	10.53%	52.63%	15.79%	21.05%	10.53%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. II Semester *(Internet of Things (IoT))*

(for batch admitted in academic session 2023-24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	3230221	DC	Discrete Structures	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP	2 Hrs
2.	3230222	DC	Data Structures	50	10	20	20	40	30	30	200	3	-	2	4	Blended	PP	2 Hrs
3.	3230223	DC	Python Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
4.	3230224	DC	Database Management System	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
5.	3220202	DC	Sensor Technology	50	10	20	20	40	30	30	200	3	-	2	4	Blended	PP	2 Hrs
Total				**250**	**50**	**100**	**100**	**160**	**120**	**120**	**900**	**12**	**03**	**08**	**19**	-	-	-
6.	3000002	Natural Sciences & Skills	Engineering Chemistry	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
Summer Internship Project – I (Institute Level) (Qualifier): Minimum two-week duration: Evaluation in III Semester.																		

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
03	-	12	04	12	03	-	04	19
15.79%	-	63.16%	21.05%	63.16%	15.79%	-	21.05%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. I Semester *(Information Technology (Artificial Intelligence and Robotics))*

(for batch admitted in academic session 2023-24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Examination	Duration of Exam
				Theory Slot				Practical Slot									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P			
				End Sem. Exam	*Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project							
1.	2240121	DC	Introduction to Artificial Intelligence	50	10	20	20	-	-	-	100	4	-	-	4	Blended	MCQ	1.5 Hrs
2.	2240122	DC	Computer Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	2240123	DC	Digital Logic Design	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	2250100	BSC	Linear Algebra	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
5.	2100022	ESC	Basic Electrical & Electronics Engineering	50	10	20	20	40	30	30	200	2	1	2	4	Blended	MCQ	1.5 Hrs
Total				**250**	**50**	**100**	**100**	**80**	**60**	**60**	**700**	**13**	**04**	**04**	**19**	-	-	-
6.	3000001	Natural Sciences & Skills	Engineering Physics	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

*Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Examination							
Theory			Lab	Theory			Lab	Total Credits
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
04	-	13	02	07	03	07	02	19
21.05%	-	68.42%	10.53%	36.84%	15.79%	36.84%	10.53%	Credits %

DEAN (ACADEMIC)
M.I.T.S

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. II Semester *(Information Technology (Artificial Intelligence and Robotics))*

(for batch admitted in academic session 2023-24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P			
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project							
1.	2240221	DC	Discrete Structures	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP	2 Hrs
2.	2240222	DC	Data Structures	50	10	20	20	40	30	30	200	3	-	2	4	Blended	PP	2 Hrs
3.	2240223	DC	Python Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
4.	2240224	DC	Database Management System	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
5.	2220202	DC	Sensor Technology	50	10	20	20	40	30	30	200	3	-	2	4	Blended	PP	2 Hrs
Total				**250**	**50**	**100**	**100**	**160**	**120**	**120**	**900**	**12**	**03**	**08**	**19**	-	-	-
6.	3000002	Natural Sciences & Skills	Engineering Chemistry	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ		
03	-	12	04	12	03	-	4	19
15.79%	-	63.16%	21.05%	63.16%	15.79%	-	21.05%	Credits %

DEAN (ACADEMICS)
M.I.T.S.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. I Semester *(Artificial Intelligence (AI) and Data Science)*

(for batch admitted in academic session 2022-23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits			
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	*Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2270121	DC	Introduction to Artificial Intelligence & Data Science	50	10	20	20	-	-	-	100	4	-	-	4	Blended	MCQ	1.5 Hrs
2.	2270122	DC	Computer Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	2270123	DC	Digital Logic Design	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	2250100	BSC	Linear Algebra	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
5.	2100022	ESC	Basic Electrical & Electronics Engineering	50	10	20	20	40	30	30	200	2	1	2	4	Blended	MCQ	1.5 Hrs
Total				**250**	**50**	**100**	**100**	**80**	**60**	**60**	**700**	**13**	**04**	**04**	**19**	-	-	-
6.	3000001	Natural Sciences & Skills	Engineering Physics	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

*Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: **Engineering Physics / Engineering Chemistry / Environmental Engineering / Language**

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO**: Assignment / Oral **OB**: Open Book **PP**: Pen Paper **SO**: Submission – Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ		
04	-	13	02	07	03	7	02	19
21.05%	-	68.42%	10.53%	36.84%	15.79%	36.84%	10.53%	Credits %

DEAN (ACADEMICS)
M.I.T.S.
GWALIOR

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. II Semester *(Artificial Intelligence (AI) and Data Science)*

(for batch admitted in academic session 2022-23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	[redacted]	Mode of Examination	Duration of Exam
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2270221	DC	Data Structures	50	10	20	20	40	30	30	200	3	-	2	4	Offline	PP	2 Hrs
2.	2270222	DC	Python Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
3.	2270223	DC	Database Management System	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
4.	2270224	DC	Operating System	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
5.	2250106	BSC	Probability and Random Process	50	10	20	20	-	-	-	100	3	1	-	4	Blended	PP	2 Hrs
Total				**250**	**50**	**100**	**100**	**120**	**90**	**90**	**800**	**12**	**04**	**06**	**19**	-	-	-
6.	3000002	Natural Sciences & Skills	Engineering Chemistry	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission – Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	[redacted]	
04	-	12	03	13	03	-	03	19
21.05%	-	63.16%	15.79%	68.42%	15.79%	-	15.79%	Credits %

DEAN (ACADEMICS)
M.I.T.S.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. I Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2022-23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits		Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	*Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2280121	DC	Introduction to Artificial Intelligence & Machine Learning	50	10	20	20	-	-	-	100	4	-	-	4	Blended	MCQ	1.5 Hrs
2.	2280122	DC	Computer Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	2280123	DC	Digital Logic Design	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	2250100	BSC	Linear Algebra	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
5.	2100022	ESC	Basic Electrical & Electronics Engineering	50	10	20	20	40	30	30	200	2	1	2	4	Blended	MCQ	1.5 Hrs
Total				**250**	**50**	**100**	**100**	**80**	**60**	**60**	**700**	**13**	**04**	**04**	**19**	-	-	-
6.	3000001	Natural Sciences & Skills	Engineering Physics	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

*Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				
Theory			Lab	Theory			Lab	Total Credits
Offline	Online	Blended	Offline	PP	AO	MCQ		
04	-	13	02	07	03	07	02	19
21.05%	-	68.42%	10.53%	36.84%	15.79%	36.84%	10.53%	Credits %

DEAN ACADEMICS
M.I.T.S.
GWALIOR

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. II Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2022-23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits		Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2280221	DC	Data Structures	50	10	20	20	40	30	30	200	3	-	2	4	Offline	PP	2 Hrs
2.	2280222	DC	Python Programming	50	10	20	20	40	30	30	200	2	1	2	4	Blended	PP	2 Hrs
3.	2280223	DC	Database Management System	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
4.	2280224	DC	Operating System	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
5.	2250106	BSC	Probability and Random Process	50	10	20	20	-	-	-	100	3	1	-	4	Blended	PP	2 Hrs
Total				**250**	**50**	**100**	**100**	**120**	**90**	**90**	**800**	**12**	**04**	**06**	**19**	-	-	-
6.	3000002	Natural Sciences & Skills	Engineering Chemistry	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language

Credits of Natural Sciences & Skills will be added in the VI Semester

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission – Oral

Mode of Offering				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ		
04	-	12	03	13	03	-	03	19
21.05%	-	63.16%	15.79%	68.42%	15.79%	-	15.79%	Credits %

DEAN (ACADEMICS)
M.I.T.S.
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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO INFORMATION AND TECHNOLOGY
2160121

L	T	P	Total Credits
4	-	-	4

COURSE OBJECTIVES

- To provide the most fundamental knowledge to the students so that they can understand what the IT is.
- To present the basics and difference of Data, Information and knowledge.
- To investigate applications of Information Technology in social media analysis, mobile and IoT analysis, time series analysis, artificial neural networks and other machine learning models.

Unit I

Attributes of Information Technology, Data vs Information vs Knowledge, Type of Data: Structure, Non Structure, Semi Structure, Images, Video, Temporal, Real Time, Data Types: Categorical/Nominal/Ordinal, Data Types Conversion, Knowledge Discovery Through Data, ICT and Digital Divide, Societal Impacts of Information Technology: Introduction, Privacy, Security and Integrity of Information, Disaster Recovery, Intellectual Property Rights, IT Projects in India.

Unit II

Cyber Space and Cyber Crime: Defining Cyberspace and Overview of Computer and Web-Technology, Architecture of Cyberspace, Communication and Web Technology, Internet, World Wide Web, Information Retrieval From the World Wide Web, Advent of Internet, Internet Infrastructure for Data Transfer and Governance, Internet Society, Regulation of Cyberspace, Concept of Cyber Security, Issues and Challenges of Cyber Security.

Unit III

Introduction to Social Networks: Types of Social Media, Social Media Platforms, Social Media Monitoring, Hashtag, Viral Content, Social Media Marketing, Social Media Privacy, Challenges, Opportunities and Pitfalls in Online Social Network, Security issues Related to Social Media, Flagging and Reporting of Inappropriate Content, Laws Regarding Posting of Inappropriate Content, Best Practices for the use of Social Media.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit IV

E-Commerce and Digital Payments: Definition of E- Commerce, Main Components of E-Commerce, Elements of E-Commerce Security, E-Commerce Threats, E-Commerce Security Best Practices, Introduction to Digital Payments, Components of Digital Payment and Stake Holders, Modes of Digital Payments- Banking Cards, Unified Payment Interface (UPI), E-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar Enabled Payments, Digital Payments Related Common Frauds and Preventive Measures.

Unit V

Artificial Intelligence: Introduction, History of AI, AI Problem, Approaches, Goals, Purpose, Scope, Terminology, and Application Areas, Industrialization and its Impact, Cyber-Physical System, Evolution of Industry, Data Availability, Relation Between Artificial Intelligence, Machine Learning, Deep Learning and other Related Fields.

RECOMMENDED BOOKS

- Artificial Intelligence A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
- Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011).
- Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
- Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers
- E. Alpaydin. Introduction to Machine Learning (3rd ed.). PHI, 2015. ISBN 978-8120350786.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. define basic concepts of Information Technology.

CO2. understand the role of IT professional

CO3. examining the cyber space and cyber crime

CO4. link the roles and opportunities of individual towards the online social media

CO5. reflect the applications of AI and ML for solving the problems over the real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO INTERNET OF THINGS (IoT)

2230121

L	T	P	Total Credits
4	-	-	4

COURSE OBJECTIVES

- To understand basic terminology of Internet of Things.
- To understand technology behind interaction between things.
- To understand basic terminology of Internet of Things.

Unit I

Internet of things (IoT): Introduction, Evaluation of IoT concept, Definition, Key features and components, IoT Building block, IoT Characteristics, Advantages and Disadvantages.

Unit II

IoT Applications, IoT application structures and driver technologies : collection, transmission, processing, managing, utilization phase, Telematics and Telemetry, Telematics vs IoT, Machine-to-Machine communication, M2M vs IoT, IoE, IIoT, V2V, V2X.

Unit III

IoT hardware and software, Study of IoT Sensors, Actuators, Wearable electronics, Standard devices, Concept of Cloud, Edge, Fog and Roof computing in IoT, Introduction to communication, Components of communication system, Modes of communication, Types of data transmission, IoT communication models : Device-to-Device, Device-to Cloud, Device-to-Gateway, and Back-End Data-Sharing, IoT Connectivity and Management.

Unit IV

Introduction to Internet and Networking Protocol, IoT protocols, Types of IoT Networks, Introduction of WSN, RF wireless sensors, RFID, WiFi, Bluetooth, IP Based Cellular Networks & 3G, 4G.

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Unit V

IoT Challenges: Interoperability, Precision, Data volume and scalability, Internet connectivity, **IoT Security**: Security vulnerabilities in overall IoT system, Security vulnerabilities at different layers of IoT architecture, IoT Privacy and Trust, Standardization gap.

RECOMMENDED BOOKS

- Internet of Things from Hype to Reality, The Road to Digitization, Ammar Rayes and Samer Salam, Second Edition, Springer
- Internet of Things (IoT) Technology, Economic View And Technical Standardization, Etienne Schneider, Version 1.0, ILNAS
- Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, Dimitrios Serpanos and Marilyn Wolf, Springer
- Data Communications and Networking, Behrouz A Forouzan, Fourth Edition, McGraw Hill Education

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COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain basic terminology of Internet of Things.

CO2. illustrate the role of communication in IoT.

CO3. identify and use various protocols devices that are used in IoT.

CO4. classify networking, cloud and fog computing concept for data management.

CO5. investigate challenges, security and privacy.

CO6. discuss different IoT enabled techniques behind interaction between things.

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO ARTIFICIAL INTELLIGENCE
2240121

L	T	P	Total Credits
4	-	-	4

COURSE OBJECTIVES

- To provide the most fundamental knowledge to the students so that they can understand what the AI is.
- To present the basic representation and reasoning paradigms used in AI.
- To investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

Unit I

Artificial Intelligence: Introduction, History of AI, AI Problem, Approaches, Goals, Purpose, Scope, Terminology, and Application Areas, Industrialization and its Impact, Cyber-Physical System, Evolution of Industry, Data Availability, Relation between Artificial Intelligence, Machine Learning, Deep Learning and other Related Fields.

Unit II

Conventional Vs Machine Learning Programming , Data/Information/Knowledge, Type of Data: Structure. Non Structure, Semi Structure. Images, Video, Temporal, Real Time, etc. Data Types: Categorical/Nominal/Ordinal, etc.... Data Types Conversion, Model, Algorithm, Model Development Life Cycle, Learning, Training, Testing, Validation, Importance of Data, AI Tools for Implementation.

Unit III

Introduction to Machine Learning: Basic Concepts of Machine Learning, Types of Learning: Supervised, Unsupervised and Reinforcement Learning, Categorical and Continuous Data, Skewness and Correlation, Regression Analysis Vs Classification, Introduction to Optimization: Evolutionary Algorithms, Genetic Algorithms: Basic Concepts, Optimization, Need for Optimization, Membership Functions.

Unit IV

Introduction to Intelligent Agent, Characteristics and functionalities, Introduction to Expert System, Roles of Expert Systems, Logic and Reasoning in AI: Introduction to Logic, Basic

of Boolean Algebra, Logic Gates, Propositional and Predicate Logic: Interpretation of Formulas, Syntax and Semantics of an Expression, Inference Rules.

Unit V

Artificial Intelligence in Real World: Speech Processing, Natural Language Processing, Planning, Engineering and Expert Systems, Fuzzy Systems, Models of Brain and Evolution, AI in Healthcare, Defence and Agriculture, Cyber Security, Agriculture, E-Commerce, Gaming, Finance, Smart Devices.

RECOMMENDED BOOKS

- Artificial Intelligence A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
- Fundamentals of Artificial Intelligence by K. R. Chowdhary, Springer.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. define basic concepts of Artificial Intelligence.

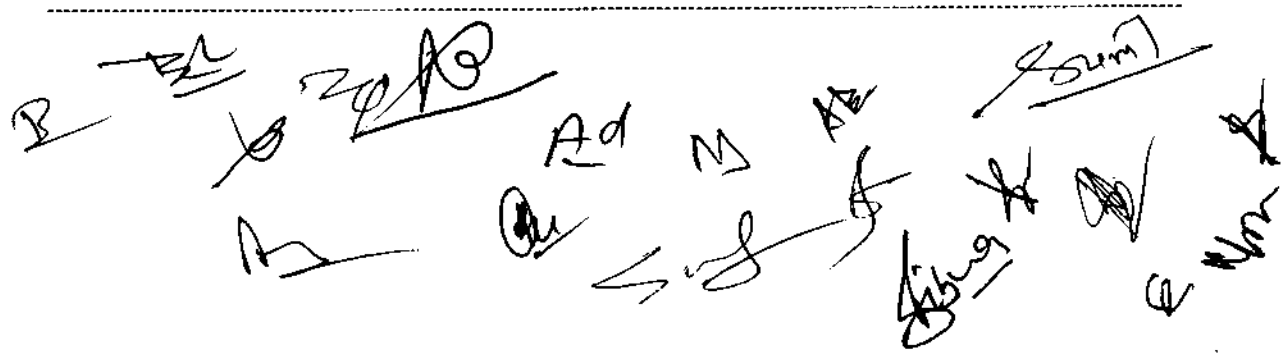
CO2. relate various computer components used in Artificial Intelligence.

CO3. identify different logical and reasoning techniques used in AI.

CO4. analyze the general approach of optimization, intelligent agent and expert system.

CO5. analyze the general approach of machine learning.

CO6. build AI enabled intelligent procedures for solving real world problems.



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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
2270121

L	T	P	Total Credits
4	-	-	4

COURSE OBJECTIVES

- To provide the most fundamental knowledge to the students so that they can understand what the AI is.
- To present the basics of Data Science (DS) and machine learning (ML) and how DS is different from ML.
- To investigate applications of AI and DS techniques in social media analysis, mobile and IoT analysis, time series analysis, security and privacy for data analytics.

Unit I

Artificial Intelligence: Introduction, History of AI, AI Problem, Approaches, Goals, Purpose, Scope, Terminology, and Application Areas, Industrialization and its Impact, Cyber-Physical System, Evolution of Industry, Data Availability. Relation between Artificial Intelligence, Machine Learning, Deep Learning and other Related Fields.

Unit II

Conventional Vs Machine Learning Programming, Data/Information/Knowledge, Type of Data: Structure, Non-Structure, Semi Structure, Images, Video, Temporal, Real Time. Data Types: Categorical/Nominal/Ordinal, Data Types Conversion. Model, Algorithm, Model Development Life Cycle, Learning, Training, Testing, Validation. Importance of Data, AI Tools for Implementation.

Unit III

Introduction to Machine Learning: Basic Concepts of Machine Learning, Types of Learning: Supervised, Unsupervised and Reinforcement Learning, Categorical and Continuous Data, Skewness and Correlation, Regression Analysis Vs Classification.

Unit IV

Introduction and importance of Data Science, modelling process in Data Science, various tools for data analytics, data handling and visualization, data scientist roles and responsibilities, privacy and security in Data Science.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit V

Artificial Intelligence and Data Science in Real World: Speech Processing, Natural Language Processing, Satellite Data Analysis, manufacturing industry, logistic industry, retail industry. AI and DS in Healthcare, Defence and Agriculture, Cyber Security, Agriculture, E-Commerce, Finance, Smart Devices.

RECOMMENDED BOOKS

- Artificial Intelligence A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
- Fundamentals of Artificial Intelligence by K. R. Chowdhary, Springer.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. define basic concepts of Artificial Intelligence.

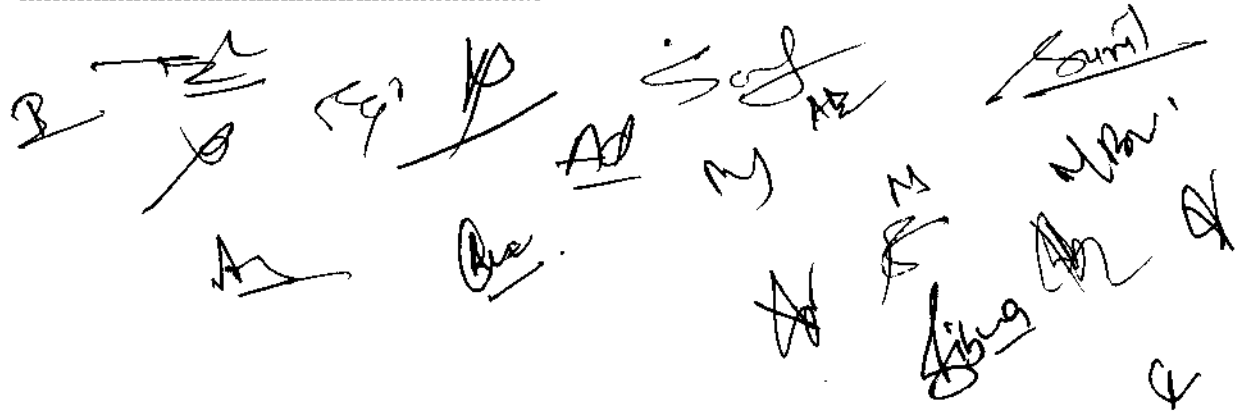
CO2. relate various computer components used in Artificial Intelligence.

CO3. identify different logical and reasoning techniques used in AI.

CO4. understand pattern discovery, data handling and data visualization

CO5. analyze the general modelling process in Data Science.

CO6. understand the real world problems and applications of AI and DS for solving the problems.



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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
2280121

L	T	P	Total Credits
4	-	-	4

COURSE OBJECTIVES

- To provide the most fundamental knowledge to the students so that they can understand what the AI is.
- To present the basics of Artificial Intelligence (AI) and machine learning (ML).
- To investigate applications of AI and ML techniques in social media analysis, mobile and IoT analysis, time series analysis, artificial neural networks and other machine learning models.

Unit I

Artificial Intelligence: Introduction, History of AI, AI Problem, Approaches, Goals, Purpose, Scope, Terminology, and Application Areas. Industrialization and its Impact, Cyber-Physical System, Evolution of Industry, Data Availability, Relation between Artificial Intelligence, Machine Learning, Deep Learning and other Related Fields.

Unit II

Conventional vs Machine Learning Programming, Data/Information/Knowledge, Type of Data: Structure, Non Structure, Semi Structure, Images, Video, Temporal, Real Time. Data Types: Categorical/Nominal/Ordinal, Data Types Conversion, Model, Algorithm, Model Development Life Cycle, Learning, Training, Testing, Validation, Importance of Data, AI Tools for Implementation.

Unit III

Introduction to Machine Learning: Basic Concepts of Machine Learning, Types of Learning: Supervised, Unsupervised and Reinforcement Learning, Categorical and Continuous Data, Skewness and Correlation, Regression Analysis Vs Classification. Supervised Learning: Linear and Logistic Regression: Linear models for classification. Sigmoid, Logistic regressions with single and multiple variables, Polynomial regression.

Unit IV

Unsupervised Learning: Clustering, Common distance measures, Hierarchical algorithms – agglomerative and divisive, partitioning algorithms – k-means and derivatives; Design and Analysis of Machine Learning Experiments: Guidelines for machine learning experiments, Factors, Response, and Strategy of experimentation, Cross-Validation and Resampling methods, measuring classifier performance.

Unit V

Artificial Intelligence and Machine Learning in Real World: Speech Processing, Natural Language Processing, Planning, manufacturing industry, logistic industry, retail industry. AI and DS in Healthcare, Defense and Agriculture, Cyber Security, Agriculture, E-Commerce, Finance, Smart Devices.

RECOMMENDED BOOKS

- Artificial Intelligence A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
- Fundamentals of Artificial Intelligence by K. R. Chowdhary, Springer.
- E. Alpaydin, Introduction to Machine Learning (3rd ed.), PHI, 2015. ISBN 978-8120350786.

COURSE OUTCOMES

After completion of the course students would be able to:

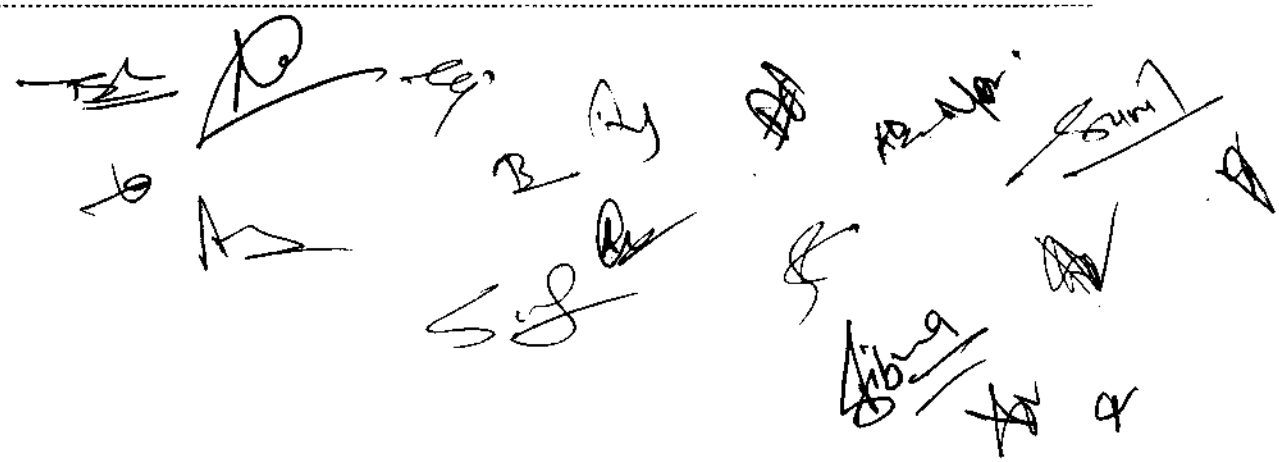
CO1. define basic concepts of Artificial Intelligence.

CO2. relate various computer components used in Artificial Intelligence.

CO3. learn about and practice a variety of Supervised and Unsupervised Learning approaches.

CO4. familiarize and learn about the latest trends and research in the field.

CO5. understand the real world problems and applications of AI and ML for solving the problems.



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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER PROGRAMMING
2160122/2230122/2240122/2270122/2280122

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To develop the understanding of algorithms, programming approaches and program documentation techniques.
- To study the concepts of procedural and object oriented programming.
- To design and implement basic programming solutions using programming constructs.

Unit I

Introduction to Programming, Types of Computer Programming Languages, Program Execution and Translation Process, Problem Solving using Algorithms and Flowcharts. Introduction to C++ Programming: Data Types, Constants, Keywords, Variables, Input/Output, Operators & Expressions, Precedence of Operators.

Unit II

Control Statements and Decision Making: goto statement, if statement, if-else statement, nesting of if statements, switch statement, while loop, do...while loop, for loop, nesting of for loops, break and continue statement. Function Basics, Function Prototypes, Passing Parameter by Value and by Reference, Default Arguments, Recursion. Arrays: One Dimensional Arrays, Multidimensional Arrays, Passing Arrays to Functions.

Unit III

Strings, Pointers, Structures and File Handling: Operations on Strings, Basics of Pointers & Addresses, Reference Variable, Pointer to Pointer, Pointer to Array, Array of Pointers, Pointer to Strings, Dynamic Memory Allocation using New and Delete Operators, Structures & Union, Pointer to Structure, Self-Referential Structures, File Concepts, Study of Various Files and Streams, Operations on Files.

Unit IV

Object Oriented Paradigm, Features of OOPS, Comparison of Procedural Oriented Programming with Object Oriented Programming, Abstract Data Types, Specification of Class, Visibility Modes, Defining Member Functions, Scope Resolution Operator, Constructors, its types, and Destructors, Creating of Objects, Static Data Member, Static

Member Function, Array of Objects, Object as Arguments, Inline Function, Friend Function.

Unit V

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading. Inheritance: Introduction, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath.

RECOMMENDED BOOKS

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusam.
- Fundamentals of Programming C++, Richard L. Halterman.

COURSE OUTCOMES

After completing this, the students will be able to:

CO1. identify situations where computational methods and computers would be useful.

CO2. develop algorithms and flowchart for a given problem.

CO3. understand the concepts of procedural programming.

CO4. explain the concepts of object oriented programming and its significance in the real world.

CO5. analyze the problems and choose suitable programming techniques to develop solutions.

CO6. develop computer programs to solve real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DIGITAL LOGIC DESIGN
2160123/2230123/2240123/2270123/2280123

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To understand the fundamental operating components of Digital Computers.
- To learn various number systems, boolean algebra employed in digital computers.
- To understand the concepts of counters, latches and flip-flops.

Unit I

Introduction to Digital Electronics, Needs and Significance, Different Number System: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic's, Binary Codes: BCD, ASCII Codes.

Unit II

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications.

Unit III

Combinational Circuits, Half Adder, Full Adder, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers.

Unit IV

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

Unit V

Introduction to Memory, Memory Decoding, Programmable Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Sequential Programmable Logic Device (SPLD), Complex Programmable Logic Device (CPLD), Field-Programmable Gate Array (FPGA), Digital Logic Design: RTL and DTL Circuits, TTL.

RECOMMENDED BOOKS

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.
- Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain the basic components and functional units to define computer architecture

CO2. explain different number systems and basic operations employed at machine level.

CO3. develop the understanding of combinational circuits.

CO4. analyse the basic concept of sequential circuits.

CO5 compare and differentiate various memories used in Computers.

CO6. reduce the boolean functions to mitigate hardware complexity issues.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DISCRETE STRUCTURES
2160124

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To perceive the knowledge of basic algebra
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer engineering
- To familiarize the discrete numeric function and generating function

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Unit-I

Finite and Infinite Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Multisets, Functions and Relations, Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains, Pigeonhole Principle.

Unit-II

Prepositional Logic, Syntax, Semantics of ATF (Atomic Formula), WFF (Well Formed Formula's),Validity and Satisfiability of WFF by Quine's Method, Normal and Closure Form of Prepositional Calculus.

Unit-III

Introduction and Basic Terminology of Graphs, Planner Graphs, Multi-Graphs and Weighted Graph, Shortest Path in Weighted Graph, Introduction to Eularian Paths and Circuits, Hamiltonian Paths and Circuits, Introduction to Trees, Rooted Trees, Path Length in Rooted Trees, Spanning Trees and Cut Trees.

Unit-IV

Introduction to Discrete Numeric Functions and Generating Functions, Introduction to Recurrence Relations and Recursive Algorithms, Linear Recurrence Relations With Constant Coefficients, Homogeneous Solutions, Particular Solutions and Total Solutions.

Unit-V

Introduction to Group, Subgroups, Generations and Evaluation of Power, Cosets and Lagrange's Theorem, Group Codes, Isomorphism and Automorphism, Homomorphism and Normal Sub Groups, Ring, Integral Domain and Field.

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DEPARTMENT OF INFORMATION TECHNOLOGY

RECOMMENDED BOOKS

- J. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science. Narsingh Deo: Graph Theory.
- Kenneth Rosen: Discrete mathematics and its applications (6th edition).2006. McGraw-Hill
- C. Liu, D. Mohapatra: Elements of Discrete Mathematics. 2008. Tata McGraw-Hill.
- T. Koshy: Discrete mathematics with applications.2003. Academic Press.
- J. Hein: Discrete structures, logic and computability.2009. Jones & Bartlett Publishers.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concept of set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure.

CO2. illustrate the knowledge of course content and distinguish between them in terms of their applications.

CO3. identify the concepts of graph and tree for solving problems in the computer science.

CO4. apply the concepts of studied topics with suitable technique faced in engineering problems

CO5. analyze the set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure to examine the real world problem.

CO6. build analytical skill and interpret applications of engineering beneficial in real time troubleshooting.

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DEPARTMENT OF INFORMATION TECHNOLOGY

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

2100022

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To impart the basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits, transformer and its terminology.
- To make familiarize the students about the working of rotating electrical machine, various electronic circuits and its importance.

Unit I

D.C. Circuits Analysis: Voltage and Current Sources: Dependent and independent source, Source conversion, Kirchhoff's Law, Mesh and Nodal analysis. Network theorems: Superposition theorem, Thevenin's theorem & Norton's theorem and their applications.

Unit II

Single-phase AC Circuits: Generation of sinusoidal AC voltage, definitions: Average value, R.M.S. value, Form factor and Peak factor of AC quantity, Concept of Phasor, analysis of R-L, R-C, R-L-C Series and Parallel circuit, Power and importance of Power factor.

Unit III

Magnetic Circuits: Basic definitions, AC excitation in magnetic circuits, self-inductance and mutual inductance, Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F. Flux,MMF and their relation, analysis of magnetic circuits.

Unit IV

Single-phase Transformer &Rotating Electrical Machines: Single phase transformer, Basic concepts, construction and working principal, Ideal Transformer and its phasor diagram at No Load, Voltage, current and impedance transformation, Equivalent circuits and its Phasor diagram, voltage regulation, losses and efficiency, testing of transformers, Construction & working principle of DC and AC machine.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit V

Digital Electronics, Devices & Circuits: Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, Demorgan's theorem, Logic gates- symbolic representation and their truth table, Introduction to semiconductors, Diodes, V-I characteristic, Bipolar junction transistors and their working, Introduction to CB, CE & CC transistor configurations.

RECOMMENDED BOOKS

- Basic Electrical and Electronics Engineering, D.P. Kothari & I.J. Nagrath-Tata McGraw Hill
- Basic Electrical and Electronics Engineering, V N Mittle & Arvind Mittal -Tata McGraw Hill
- Basic Electrical and Electronics Engineering, S. K Bhattacharya -Pearson
- Electrical Machinery- A.E. Fitzgerald, C. Kingsley and Umans - TMH
- Principles of Electrical Engineering- Vincdent Del Toro- Prentice Hall.
- Basic Electrical Engineering -A,E. Fitzgerald, Higginbotham and Grabel -TMH
- Integrated Electronics- Millmann & Halkias
- Electronics Devices & circuits- Sanjeev Gupta, Dhanpat Rai Publication.
- Basic Electrical and Electronics Engineering, D.C Kulshreshtha-Tata McGraw Hill

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COURSE OUTCOMES

After completion of the course students would be able to:

CO 1. solve DC & AC circuits by applying fundamental laws & theorems

CO 2. compare the behavior of electrical and magnetic circuits for given input

CO 3. explain the working principle, construction, applications of rotating electrical machines

CO 4. explain the working principle, constructional details, losses & applications of single phase transformer.

CO 5. select the logic gates for various applications in digital electronic circuits.

CO 6. explain characteristics of diode and transistor.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IT WORKSHOP
2160125

L	T	P	Total Credits
-	-	2	1

COURSE OBJECTIVES

- To make use of computers for various purposes like surfing the net, sending/ receiving emails, preparation of various documents and presentations, preparing small databases, maintenance of accounts.
- To acquire the knowledge of computer system, mother board and its processing unit.
- To be aware of different memories, windows installation, hardware and software troubleshooting.

Unit-I

Computer Hardware: Introduction to Hardware Peripherals like RAM, ROM, Keyboard, Hard disk drive, Mouse , Processors, Generation of processor , Working of SMPS , Study of various ports, Assembly and Disassembly of Computer, Study of Networking Cable and it's types, Installation and Partition of Hard Disk, Troubleshooting & Fault finding.

Unit-II

Operating System and software installations: Introduction to Operating System, Types of Operating System (Windows and Linux), Evolution of Operating System, Introduction of Software, Types of Software, Installation steps for Operating System (Windows, Linux etc), Creating Virtual Machine using VMware/ VirtualBox.

Unit-III

Word & Excel Orientation: Overview of Microsoft office word / Excel, New Features of Microsoft Office, Working with Documents in Microsoft Word /Excel, Saving the File, Formatting the Text, Alignment of Text, Applying Fonts, Spell Checking, Inserting Header and Footer , Charts and Graphics in Microsoft Word/Excel, Working with Tables, functions and Macros in Microsoft Word/Excel, Validating Data in Microsoft Excel, Using formulae in Excel, Creating project/certificates/Newsletter using Word.**PowerPoint Presentation:** Introduction to Microsoft PowerPoint, Use of Standard Formatting toolbar, Working with Charts and Tables, Editing slides, Changing templates, Slide Layouts, Inserting clipart &

Pictures into slide, Slide Transitions, Animation, Inserting sound and movies into slides, Create & Deliver dynamic presentation.

Unit-IV

Computer Application: Microsoft Disk Operating System (MS-DOS): Internal Commands, External Commands, Batch File etc. Overview of Linux, Common Linux Features, **Essential Linux commands**, Advantage of Linux, Creating E-mail Account, E-mail Writing , Blog Writing, Net Surfing and Chatting ,Customize Web Browser with the LAN proxy setting, Bookmarks, Search Toolbars and Pup up Blockers, Install Antivirus Software, Configure personal firewall and Window update, Customize browser to block pop ups, Cyber Hygiene.

Unit-V

Internet: Introducing the Networking concept using LAN & WAN, Introduction, Evolution and Uses of Internet, Concepts of Web Browser, Web Page and Web Site, Study of various Internet based services like Email, Social Network. Chat, Introduction to Cyber Security and Cyber Laws.

Server: Introduction to Server, Difference between server and normal desktop, Evolution of servers. Study of various servers. Web designing using HTML/CSS.

RECOMMENDED BOOKS

- Comdex Information Technology course tool kit Vikas Gupta. WILEY Dreamtech
- The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dreamtech.
- Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education.
- PC Hardware and A+ Handbook - Kate J. Chase PHI (Microsoft)

COURSE OUTCOMES

After completion of the course student would be able to:

CO1. understand the basic concept and structure of computer hardware and networking.

CO2. demonstrate installation of windows and connections through ports at basic level.

CO3. identify the existing configuration of the computers and peripherals.

CO4. apply the knowledge about computer peripherals to identify rectify problems onboard.

CO5. explain the concept of Memory, Motherboard, Bus and SMPS.

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CO6. manage data backup and restore operations on computer and update application software.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Experiments List and Skill Based Mini Project of Laboratory Courses B. Tech I Semester (Batch Admitted in 2023-24) (Information Technology/Internet of Things (IoT)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence and Data Science/ Artificial Intelligence and Machine Learning) Under Flexible Curriculum

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER PROGRAMMING
2160122/2230122/2240122/2270122/2280122

LIST OF PROGRAMS

1. Write a program to add two numbers and display its sum.
2. Write a Program to calculate and display the volume of a cylinder for height and radius parameters to be input from the user.
3. Write a program to realize the following expressions:
   a. V = u + at
   b. S = ut+1/2a
   c. T=2*a+√b+9c
4. Write a program to take input of name, rollno and marks obtained by a student in 5 subjects of 100 marks each and display the name, rollno with percentage score secured.
5. Write a program to swap values of two variables with and without using the third variable.
6. Write a program to illustrate the use of unary prefix and posttfix increment and decrement operators.
7. Write a program to find the largest of three numbers using ternary operators.
8. Write a program to find the roots of quadratic equation.
9. Write a Program to Check Whether a Number is Prime or not.
10. Write a program to compute the grade of students using if else ladder as per MITS norms.
11. Write a program to check whether the entered year is leap year or not (a year is leap if it is divisible by 4 and divisible by 100 or 400.)
12. Write a program to print the sum of digits of a number using for loop.
13. Write a program to display the following pattern using for loops.

(i)

```
* * * * *
* * * *
* * *
* *
*
```

(ii)

```
1
2 2
3 3 3
4 4 4 4
5 5 5 5 5
```

(iii)

```
        1
      1 2
    1 2 3
  1 2 3 4
1 2 3 4 5
```

(iv)

```
A
A B
A B C
A B C D
A B C D E
```

(v)

```
        *
      * * *
    * * * * *
  * * * * * * *
* * * * * * * * *
```

(vi)

```
* * * * * * * * *
  * * * * * * *
    * * * * *
      * * *
        *
```

(vii)

```
        1
      1 2 1
    1 2 3 2 1
  1 2 3 4 3 2 1
1 2 3 4 5 4 3 2 1
```

(viii)

```
A B C D E F
A B C D E
A B C D
A B C
A B
A
```

14. Write a program to calculate factorial of a number using recursion.

15. Write a program to add two matrices of the same order.

16. Write a program to add two complex numbers, use structure data-type to represent complex numbers.

17. Write a program to create 10 objects of a student class containing the student's name, ID, Semester and CGPA as data members, and getDetails(), setDetails() as member functions. The class should also contain static variables which keep track of the student with maximum CGPA in each semester. The class should also contain a constructor to initialize the data members.

COURSE OUTCOMES

After completing this, the students will be able to:

CO1. apply basic programming concepts .

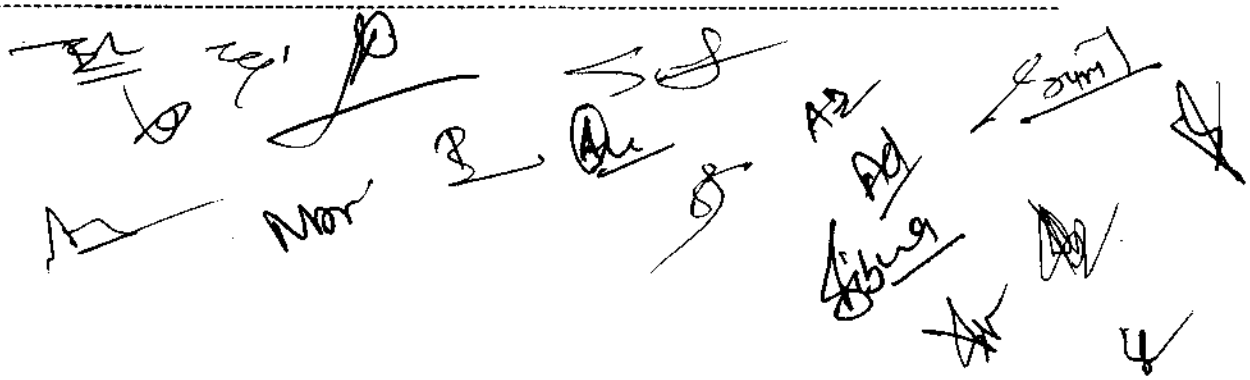
CO2. develop algorithms and flowchart for a given problem.

CO3. illustrate the concepts of procedural programming.

CO4. implement the concepts of object oriented programming.

CO5. design suitable programming solutions using procedural/object oriented programming paradigms.

CO6. develop computer programs to solve real world problems.



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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER PROGRAMMING
2160122/2230122/2240122/2270122/2280122
LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

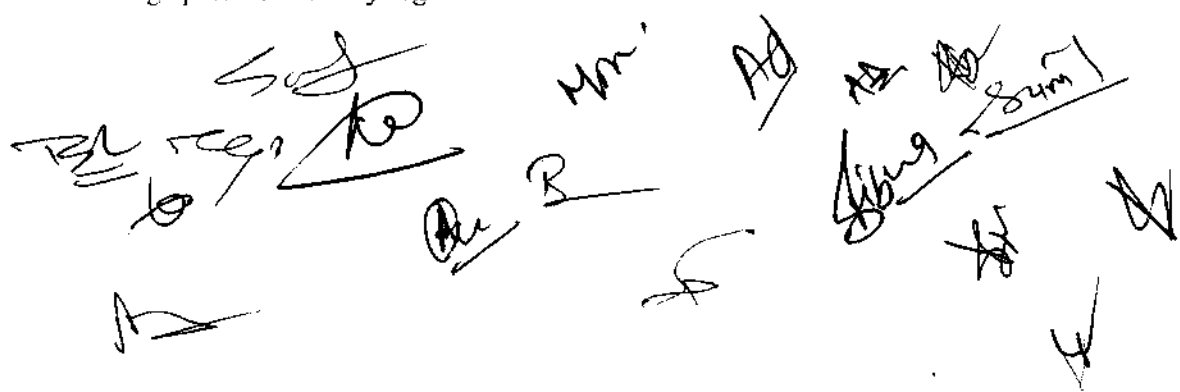
1. Two strings A and B are given, each consisting of lower case alphabets. Write a program to find whether it is possible to choose some non-empty strings s1 and s2 where s1 is a substring of A, s2 is a substring of B such that s1 + s2 is a palindromic string. Here '+' denotes the concatenation between the strings, and if there are such strings S1 and S2 then print S1+S2.

2. Following conditions are given based on three subjects marks:
   a. Physics marks must be greater than 80
   b. Chemistry marks must be greater than 80
   c. English marks must be greater than 70

   Students are awarded grade 10 if all three conditions are met. Grade 9 is given if conditions a and b are met. Grade 8 is given if conditions b and c are met. Grade 7 is given if a and c are met. Grade is 6 if only one condition is met . Grade is 5 if none of the three conditions are met. Write a program to display the grade of students, based on the values of physics, chemistry and English, given by the user. Also, display the calculated grade only if the overall marks (out of 300) are greater than 32%, otherwise display 'the student is Fail'.

List of Macro Projects:

1. Design a flowchart to implement the Tic-Tac-Toe game and hence implement the same using C++.
2. Write a program in C++ that implements the operations performed by an ATM. The operations include: Balance check, Withdraw Cash, Deposit cash etc.
3. Create a login module using C++ with below mentioned features:
   a. Verify username and password correctly.
   b. Register new user and set its password.
   c. Change password of any registered user.



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DEPARTMENT OF INFORMATION TECHNOLOGY

List of Mini Projects:

1. Library Systems is aimed to computerize the library management operations, e.g. Registering a Student, Issuing a book, Handling Book Return, etc. Write a program in C++ which implements these operations.
2. A Question Bank System computerized the MCQ based exams. It takes input from a file having questions, presents them randomly before the examinee, counts time to complete the exam and finally presents the marks obtained. Use OOPS concepts to implement the question bank system.
3. Design a Student Record Management System in C++ which maintains the personnel as well as academic record of students and provides various options for searching a student in the system.
4. Ram and Shyam are playing a game. Ram initially has the number **A** and Shyam has the number **B**. There are a total of **N** turns in the game, and Ram and Shyam alternatively take turns. In each turn the player whose turn it is, multiplies his or her number by 2. Ram has the first turn. Suppose after all the **N** turns, Ram's number has become **C** and Shyam's number has become **D**. Write a program to calculate the integer division of the maximum number among **C** and **D** by the minimum number among **C** and **D**.
5. There's an array A consisting of N non-zero integers $A_{1..N}$. A subarray of A is called alternating if we take any two adjacent elements in it , then one of them should be even and the other should be odd. For each x from 1 to N, write a program to compute the length of the longest alternating subarray that starts at x - that is, a subarray $A_{x..y}$ for the maximum possible $y \geq x$. The length of such a subarray is y-x+1.
6. Given an array $A_1, A_2, \ldots, A_N$, count the number of subarrays of array A which are non-decreasing. A subarray A[i,j], where $1 \leq i \leq j \leq N$ is a sequence of integers $A_i, A_{i+1}, \ldots, A_j$. A subarray A[i,j] is non-decreasing if $A_i \leq A_{i+1} \leq A_{i+2} \leq \ldots \leq A_j$. Write a program to count the total number of such subarrays.
7. Two strings A and B are given, each consisting of lower case alphabets. Write a program to find whether it is possible to choose some non empty strings s1 and s2 where s1 is a substring of A, s2 is a substring of B such that s1 + s2 is a palindromic string. Here '+' denotes the concatenation between the strings. And if there are such strings S1 and S2 then print S1 S2.
8. There are N students standing in a row and numbered 1 through N from left to right. You are given a string S with length N, where for each valid i, the i-th character of S is 'x' if the i-th student is a girl or 'y' if this student is a boy. Students standing next to each other in the row are friends .The students are asked to form pairs for a project. Each pair must consist of a boy and a girl. Two students can only form a pair if they are friends. Each student can only be part of at most one pair. Write a program to find the maximum number of pairs that can be formed.
9. Following conditions are given based on three subjects marks
    a. Physics marks must be greater than 50
    b. Chemistry marks must be greater than 80
    c. English marks must be greater than 70

Students are awarded grade 10 if all three conditions are met. Grade 9 is given if conditions a and b are met. Grade 8 is given if conditions b and c are met. Grade 7 is given if a and c are met. Grade is 6 if only one condition is met . Grade is 5 if none of the three conditions are met. Write a program to display the grade of students , based on the values of physics, chemistry and English, given by the user. Use object oriented programming to implement the system.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IT WORKSHOP
(2160125)
LIST OF PROGRAMS

1. Basics of DOS/Linux commands
2. Design a Resume on MS-Word.
3. Create a letter pad for company/Institute/Organization using MS-Word.
4. Write and describe short-cut commands using in MS-Word.
5. Create a work-sheet based on simple formulas.
6. Write and describe short-cut commands using in MS-Word.
7. Create a worksheet to show the chart.
8. Create a Presentation that show your past academic results.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IT WORKSHOP
(2160125)
LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Study of PC trouble shooting and Fault finding on PC Hardware trainer.
2. Study of Network communication fundamentals on LAN Trainer.
3. Study the features of Microsoft Word.
4. Study the features of Microsoft Excel.
5. Study the features of Microsoft PowerPoint.

List of Macro Projects:

1. Study of Processors
2. Study of Networking cable and it's type
3. Study of PC Assembling
4. Study of Computer hardware (Input-Output, memory devices)
5. Study of HTML/CSS
6. Study of Web browser

List of Mini Projects:

1. Create a Virtual Machine using VMWARE.
2. Design a Webpage (Based on application using HTML/CSS.
3. Create a word document using mail-Merge (Based on application).
4. Create a work sheet with make use of Statistical function.
5. Create a work sheet with make use of common statistical functions.
6. Create a Power point presentation about your journey to MITS from 11th standard onwards.

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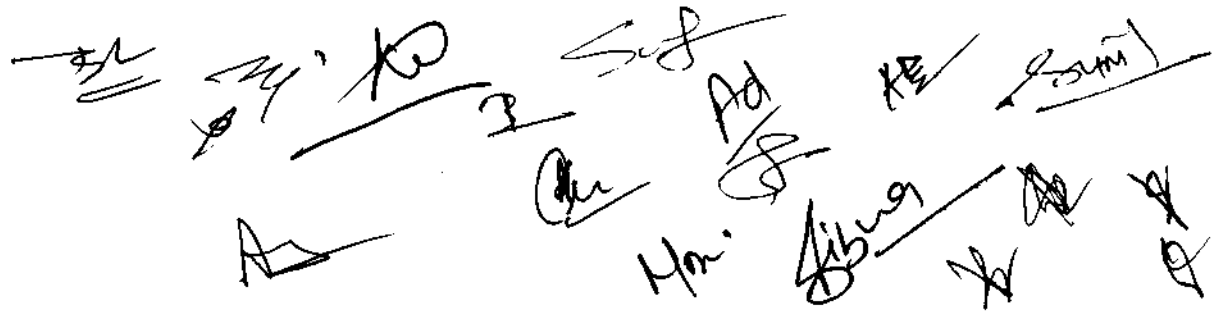
DEPARTMENT OF INFORMATION TECHNOLOGY

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(100022)
LIST OF PROGRAMS

1. To verify Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2. To verify Superposition Theorem.
3. To determine resistance inductance of a choke coil.
4. To determine active reactive power in a single phase A.C circuit.
5. To determine voltage ratio & current ratio of a single phase transformer.
6. To determine the polarity of a single phase transformer.
7. To perform open circuit & short circuit test on a single phase transformer.
8. To study multimeter measure various electrical quantities
9. To study of constructional details of DC machine.
10. To determine the V-I characteristics of diode in forward bias & reverse bias condition.



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DEPARTMENT OF INFORMATION TECHNOLOGY

BASIC ELECTRICAL & ELECTRONICS ENGINEERING (100022)

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Study of voltage and current source.
2. Study of various loads in electrical circuits.
3. Study of resistance and inductance.
4. Study of capacitance and inductance.
5. Study of energy and power in an arbitrary circuit.
6. Study of electrical switch.
7. Study of EM induction theory.
8. Study of hazard while electrical circuit dealing.
9. Study of energy and power meters.

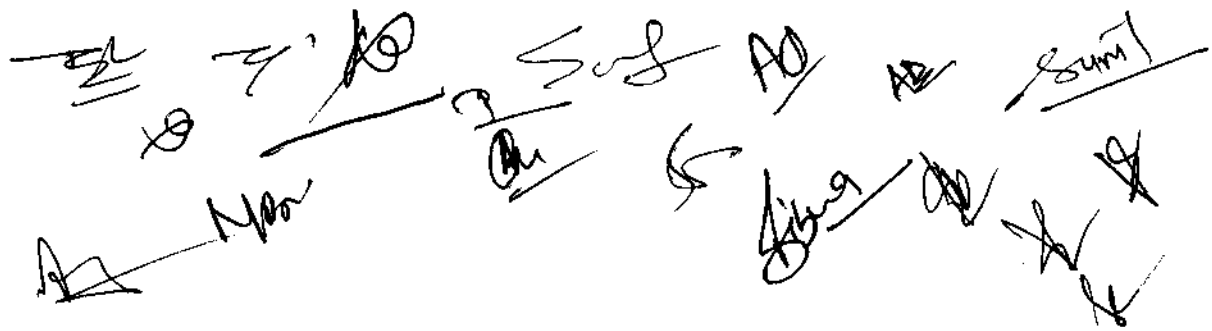
List of Macro Projects:

1. Study of current and voltage mathematical representation.
2. Identify the various electrical loads in household applications.
3. Identify and draw the circuit diagram of FTL.
4. Study of circuit response of RC network.
5. Differentiate energy and power of a RL circuit.
6. Construction of different types of electrical switches.
7. Study of EM induction in DC and AC motors.
8. Study of electrical safety norms.
9. Identification and differentiate the digital and analog energy/ power meters.

List of Mini Projects:

1. Enlist the different electrical loads available in your home and prepare their rating chart.
2. Design the residential house wiring using fuse, switch, and indicator, lamp and energy meter. Also apply the Thevenin's theorem for finding the current in a particular branch of the circuit.
3. If one FTL (Fluorescent Tube Light) is replaced by LED bulb. Calculate the Monthly electrical energy saving? Calculate the monthly savings in electricity bill?
   Note: LUX level of FTL and LED bulbs must be the same (follow BEE Guidelines).
   Consider electricity bill charges from MP Vidyut Vitran company website.

4. What is the use of condenser in a ceiling fan? Draw a wiring diagram for the testing of motor winding.
5. Find the different ways/ Methodologies/ Guidelines, by which energy can be conserved in domestic applications?
6. Design a working model for controlling one lamp by two 2-way switch.
7. Visit the electrical machine lab and enlist different types of AC and DC motors along with their ratings. Also mention their industrial applications.
8. Visit the panel room and identify the different safety practices followed by electrical engineer.
9. Enlist different measuring instruments available in electrical workshop lab. Also prepare a comparison chart for Analog and digital measuring instruments.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA STRUCTURES

2160221/2230222/2240222/2270221/2280221

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

Unit-I

Introduction to Data Structures: Algorithms & their characteristics, asymptotic notations. arrays and its representations, index to address translation. **Link list:** Introduction, implementation of linked list, operations, circular link list, doubly linked list, polynomial manipulation using linked list.

Unit-II

Stacks: Concepts and implementation of stacks, operations on stack, conversion of infix to postfix notation, evaluation of postfix expression, recursion.

Queues: Concepts and implementation, operations on queues, dequeue, priority queues, circular queues and application.

Unit-III

Trees: Types. terminology, binary tree -representations, traversal, conversion of general tree to binary tree. binary search tree, threaded binary tree and height balanced tree.

Unit-IV

Graphs: Background. graph theory terminologies. representation of graphs- sequential & linked representation, path matrix, graph traversals- BFS. DFS. spanning trees, applications of graph.

Unit-V

Searching & Sorting: Linear search, binary search. bubble sort. selection sort, insertion sort. quick sort. merge sort, radix sort and heap sort. comparison between sorting techniques. hashing and collision resolution techniques.

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DEPARTMENT OF INFORMATION TECHNOLOGY

RECOMMENDED BOOKS

- Data Structures, Algorithms and Applications in C++, Sartaj Sahni, 2nd Edition.
- An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Mcgraw hill.
- Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. outline the basics of Algorithms and their performance criteria.

CO2. explain the working of linear/Non Linear data structures.

CO3. identify the appropriate data structure to solve specific problems.

CO4. analyze the performance of various Data Structures & their applications.

CO5. evaluate the time/space complexities of various data structures & their applications.

CO6. design the optimal algorithmic solutions for various problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DISCRETE STRUCTURES
2230221/2240221

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To perceive the knowledge of basic algebra
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer engineering
- To familiarize the discrete numeric function and generating function

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Unit-I

Finite and Infinite Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Multisets, Functions and Relations, Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains, Pigeonhole Principle.

Unit-II

Prepositional Logic, Syntax, Semantics of ATF (Atomic Formula), WFF (Well Formed Formula's),Validity and Satisfiability of WFF by Quine's Method, Normal and Closure Form of Prepositional Calculus.

Unit-III

Introduction and Basic Terminology of Graphs, Planner Graphs, Multi-Graphs and Weighted Graph, Shortest Path in Weighted Graph, Introduction to Eulerian Paths and Circuits, Hamiltonian Paths and Circuits.

Unit-IV

Introduction to Discrete Numeric Functions and Generating Functions, Introduction to Recurrence Relations and Recursive Algorithms, Linear Recurrence Relations With Constant Coefficients, Homogeneous Solutions, Particular Solutions and Total Solutions.

Unit-V

Introduction to Group, Subgroups, Generations and Evaluation of Power, Cosets and Lagrange's Theorem, Group Codes, Isomorphism and Automorphism, Homomorphism and Normal Sub Groups, Ring.

RECOMMENDED BOOKS

- J. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science Narsingh Deo: Graph Theory.
- Kenneth Rosen: Discrete mathematics and its applications (6th edition) 2006 McGraw-Hill
- C. Liu, D. Mohapatra: Elements of Discrete Mathematics 2008, Tata McGraw-Hill.
- T. Koshy: Discrete mathematics with applications 2003, Academic Press.
- J. Hein: Discrete structures, logic and computability 2009, Jones & Bartlett Publishers.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concept of set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure.

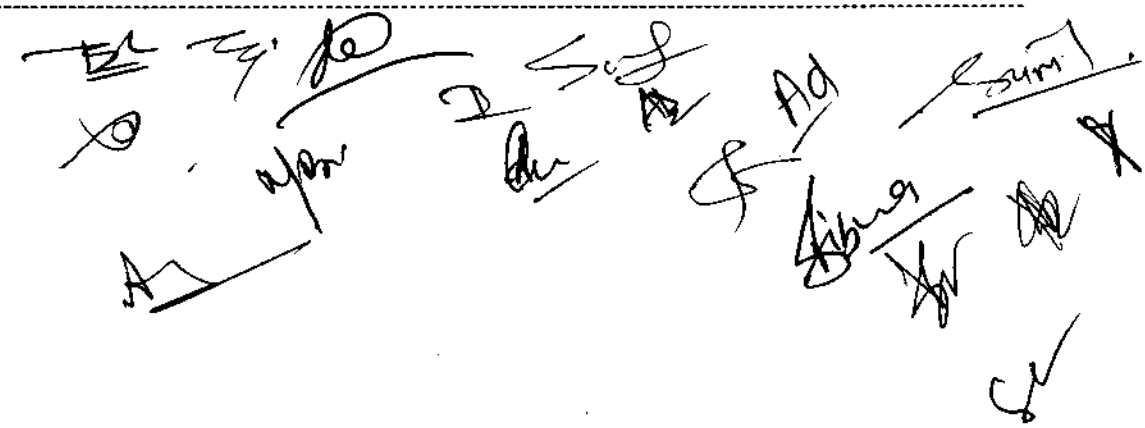
CO2. illustrate the knowledge of course content and distinguish between them in terms of their applications.

CO3. identify the concepts of graph for solving problems in the computer science.

CO4. apply the concepts of studied topics with suitable technique faced in engineering problems

CO5. analyze the set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure to examine the real world problem.

CO6. build analytical skill and interpret applications of engineering beneficial in real time troubleshooting.



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DEPARTMENT OF INFORMATION TECHNOLOGY

PYTHON PROGRAMMING
2160222/2230223/2240223/2270222/2280222

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To develop the understanding of algorithms, programming approaches and program documentation techniques in Python.
- To study the concepts of procedural and object oriented programming techniques in Python.
- To design and implement basic programming solutions using Python programming constructs.

Unit I

Introduction to Python: Formal and natural languages, Downloading and installing Python. Problem-solving methods and algorithm development. The first program, Variables, expressions, keywords, Operators, Expressions and statements, Interactive mode and script mode, Order of operations. Datatypes: Numeric, string, list tuple, dictionary, set.

Unit II

Function, ways of passing arguments to functions, user defined and inbuilt functions, lambda function. Control Statements: Conditional and unconditional branching, while loop, for loop, loop control statements, range function. Numeric, String, list, tuple, dictionary and set manipulation operations using loops and inbuilt manipulation functions. Packages and modules in python.

Unit III

Exception and File Handling: Errors vs exceptions, Exceptions handling with try block, handling multiple exceptions, writing your own exceptions, file handling modes, reading, writing and appending a file. Handling file exceptions.

Unit IV

Object oriented programming: Characteristics and features of OOPS, Classes and objects, constructors and destructors, defining member variables and functions, visibility modes, static members.

Unit V

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, polymorphism in python. Inheritance: Introduction.

Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath. Association, Aggregation and composition. Array manipulation and visualization using numpy and matplotlib libraries.

RECOMMENDED BOOKS

- Python Crash Course: A Hands-On, Project-Based Introduction to Programming, By Eric Matthes.
- Learn Python the Hard Way: third Edition T.R. Padmanabhan, Programming with Python, Springer, first Ed., 2016.
- Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning, first Ed., 2012.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define basics syntax and features of python programming language

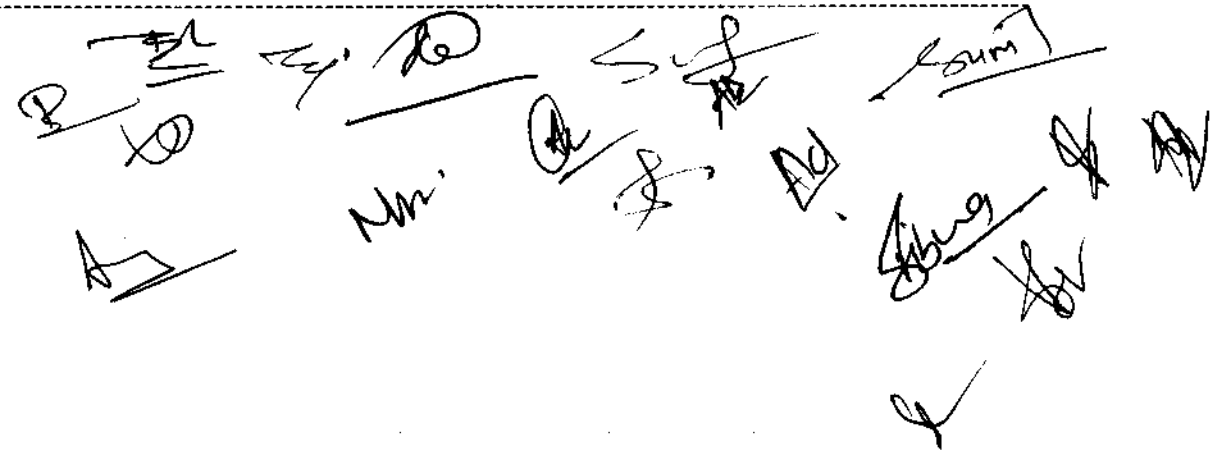
CO2. solve computational problem using python language.

CO3. take part in online coding platforms.

CO4. inspect the python program for errors.

CO5. design a program using the features of object oriented concept.

CO6. construct the python code for real world problem using the libraries.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DATABASE MANAGEMENT SYSTEM
2160223/2230224/2240224/2270223/2280223

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modelling, relational, hierarchical and network models.
- To understand and use data manipulation language to query, update and manage a database.

Unit-I

DBMS: Database Approach v/s Traditional File Approach, Advantages of Database System, Database Users and Administrator, Database System Environment, Application Architectures, Schemas, Instances, Data Independence, Data Models: Hierarchical Data Model, Network Data Model & Relational Data Model. Comparison between Models.

Entities and Relationship Model: Entity types, Entity sets, Attributes and Keys. Relationship Types and Sets. Constraints, Design issue, E-R Diagram, Weak Entity Sets.

Unit-II

Relational Model: Structure of Relational Databases: Relation, Attribute, Domain, Tuples, Degree, Cardinality, Views. Database Relations. Properties of Relations. Attributes. Keys. Attributes of Relation, Domain Constraints. Integrity Constraints.

Relational Algebra: Concepts and Operations: Select, Project, Division, Intersection, Union, Division. Rename. Join etc.

Unit-III

SQL: Purpose of SQL, Data Definition Language (DDL) Statements, Data Manipulation Language (DML) Statements Update Statements & Views in SQL, Data Control Language (DCL), Triggers.

Unit-IV

Relational Database Design: Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependency, Process of Normalization, Various Normal Forms

1NF, 2NF, 3NF, BCNF, Decomposition, Desirable Properties of Decomposition: Dependency Preservation, Lossless Join, Problems with Null Valued & Dangling Tuple, Multivalued Dependencies.

Unit-V

Transaction Management: Transaction Concept, Transaction State, Concurrent Executions, Serializability: Conflict and View Serializability, Concurrency Control: Lock-Based Protocol, Recovery: Log-Based Recovery.

RECOMMENDED BOOKS

- Database System Concepts, Abraham Silberschatz Henry F. Korth S. Sudarshan, McGraw-Hill 6th Edition.
- Database Management System, Raghu Ramakrishnan Johannes Gehrke, McGraw Hill 3rd Edition.
- Fundamentals of Database System, Elmasri & Navathe, Addison-Wesley Publishing, 5th Edition.
- An Introduction to Database Systems, Date C. J, Addison-Wesley Publishing, 8th Edition.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. demonstrate the concepts of different types of database system.

CO2. apply relational algebra concepts to design database system.

CO3. make use of queries to design and access database system.

CO4. analyze the evaluation of transaction processing and concurrency control.

CO5. determine the normal form of the relation.

CO6. design a ER diagram/database system for a real world application.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER SYSTEM ORGANIZATION
2160224

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVE

- To provide the fundamental knowledge of a computer system and its processing units.
- To provide the details of input & output operations, memory management and performance measurement of the computer system.
- To understand how computer represents and manipulate data.

Unit -I

Introduction: Von Newman Model, Various Subsystems: Input Unit, Output Unit, Memory Unit, CPU, Accumulator, Memory Registers, Program Counter, System Bus, Register Transfer and Micro Operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Register Transfer Micro-Operations, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations.

Unit- II

Computer Arithmetic: Addition and Subtraction with Signed-Magnitude, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations.

Central Processing Unit (CPU): General Purpose Register Organization, Stack Organization. Instruction Formats, Addressing Modes. Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Hardwired and Micro Programmed Control.

Unit -III

Microprocessors: Introduction of 8085 Microprocessor: Architecture, Instruction Set, Addressing Modes, Interrupts and Basic Assembly Language Programming.

Unit –IV

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Data Transfer-Serial/ Parallel, Simplex/ Half Duplex/ Full Duplex.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit-V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory- Organization and Mappings, Memory Management Hardware, Introduction to Pipelining & Multiprocessors.

RECOMMENDED BOOKS

- Computer System Architecture, Morris Mano, PHI.
- Microprocessor Architecture, Programming and Applications with the 8085, Gaonkar, Penram International Publishing (India) Pvt.Ltd.
- Computer Organization. Carl Hamacher. THM.
- Computer Architecture and Organization, J P Hayes, Mc-Graw Hills, New Delhi.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. recall the basic building blocks of computer Architecture.

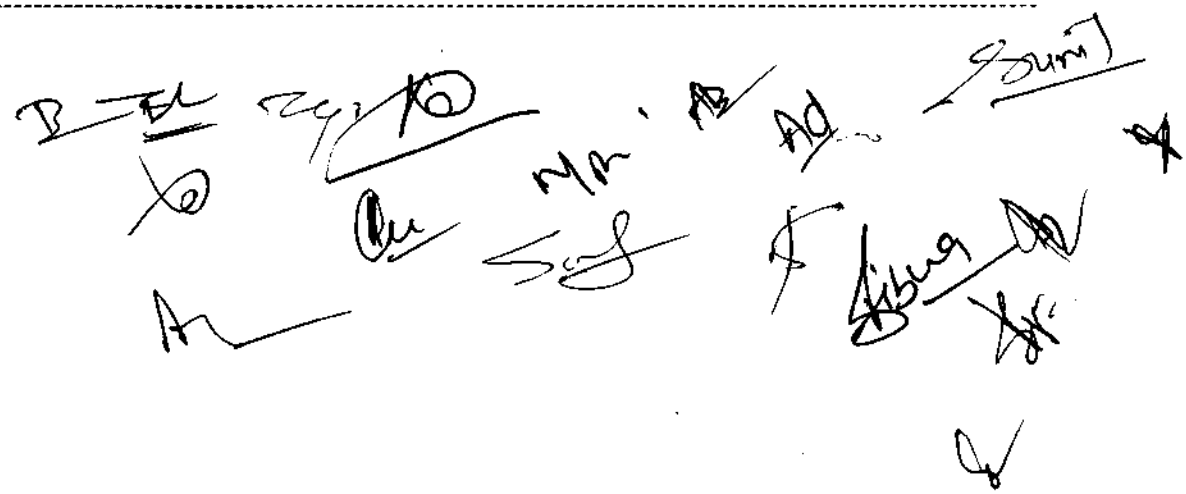
CO2. compare different memories.

CO3. apply the concept of memory mapping, multiprocessor and pipelining in solving real world problems.

CO4. analyze various modes of Input-Output data transfer.

CO5. evaluate the arithmetic related to the number system.

CO6. develop the skill of writing low level programming.



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DEPARTMENT OF INFORMATION TECHNOLOGY

OPERATING SYSTEM
2270224/2280224

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

Unit I

Basics of Operating System: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Unit II

Process Management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

Unit III

Process Synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Unit IV

Memory Management: Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit V

Storage Management: Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

RECOMMENDED BOOKS

- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

CO1. define the basic concept of operating systems.

CO2. explain the working procedure of the operating system.

CO3. analyze the various operating system problems and issues.

CO4. determine the solutions for various operating system problems and issues.

CO5. evaluate the performance of various scheduling and allocation techniques.

CO6. elaborate the working of various scheduling and allocation techniques.

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DEPARTMENT OF INFORMATION TECHNOLOGY

List of Experiments and Skill Based Mini Projects of Laboratory Courses B. Tech II Semester (Batch Admitted in 2023-24) (Information Technology/ Internet of Things (IoT)/ Artificial Intelligence and Robotics/Artificial Intelligence & Data Science (AI&DS) / Artificial Intelligence & Machine Learning (AI&ML)) Under Flexible Curriculum

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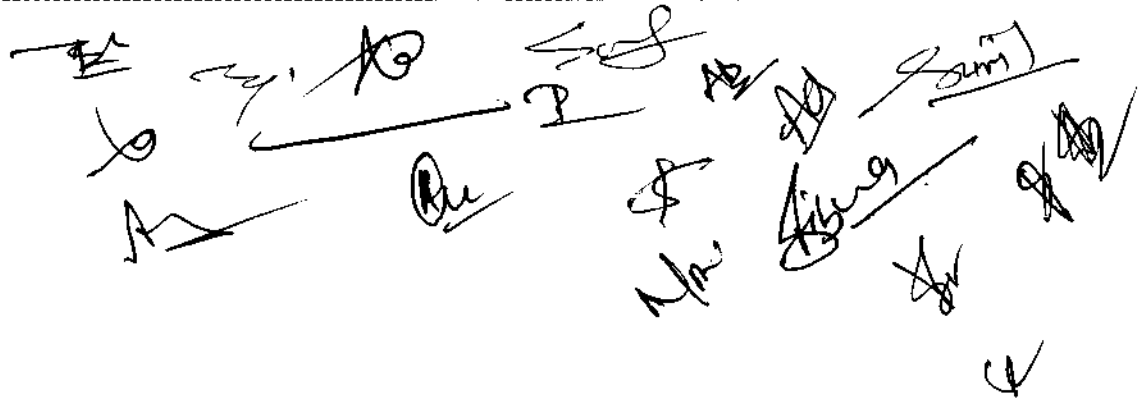
DEPARTMENT OF INFORMATION TECHNOLOGY

DATA STRUCTURES
2160221/2230222/2240222/2270221/2280221
LIST OF PROGRAMS

1. Write a program to implement doubly linked list with all possible deletion operations.
2. Write a program to insert an element in the beginning of the circular linked list.
3. Write a program to implement stack using linked list.
4. Write a program to count the number of nodes in the binary search tree.
5. Write a program to implement AVL Tree.
6. Write a program to traverse the BST in pre-order and post-order.
7. Write a program to implement Graph using an array.
8. Write a program to implement Breadth First Search.
9. Write a program to implement Depth First Search.
10. Write a program to implement Spanning Tree.
11. Write a program to implement binary search algorithm.
12. Write a program to implement Heap Sort.
13. Write a program for implementing the Radix Sort methods to arrange a list of integers in ascending order.
14. Write a program for implementing the Quick Sort methods to arrange a list of integers in ascending order.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA STRUCTURES
2160221/2230222/2240222/2270221/2280221
LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Write a program to create an array of N Integer Elements.
2. Write a program to implement linear search in an array.
3. Write a program to create Singly Linked List (SLL) of Integer Data.
4. Write a program for implementing the Selection sort methods to arrange a list of integers in ascending order.

List of Macro Projects:

1. Design, Develop and Implement a menu driven Program for the following Array operations
    a. Inserting an element at a given valid Position
    b. Deleting an element at a given valid Position
    c. Display of array elements
2. Design, Develop and Implement a menu driven Program for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)
    a. Push an Element on to Stack
    b. Pop an Element from Stack
    c. Demonstrate Overflow and Underflow situations on Stack
    d. Exit
3. Design, Develop and Implement a menu driven Program for the following operations on doubly linked list:
    a. Insert at the beginning.
    b. Insert at specific position.
    c. Insert at the end.
    d. Exit.
4. Given an array of elements, construct a complete binary tree from this array in level order fashion. That is, elements from left in the array will be filled in the tree level wise starting from level 0.
5. Design, Develop and Implement a menu driven Program for the following operations on Binary Search Tree (BST) of Integers
    a. Create a BST of N Integers.
    b. Traverse the BST in In-order.

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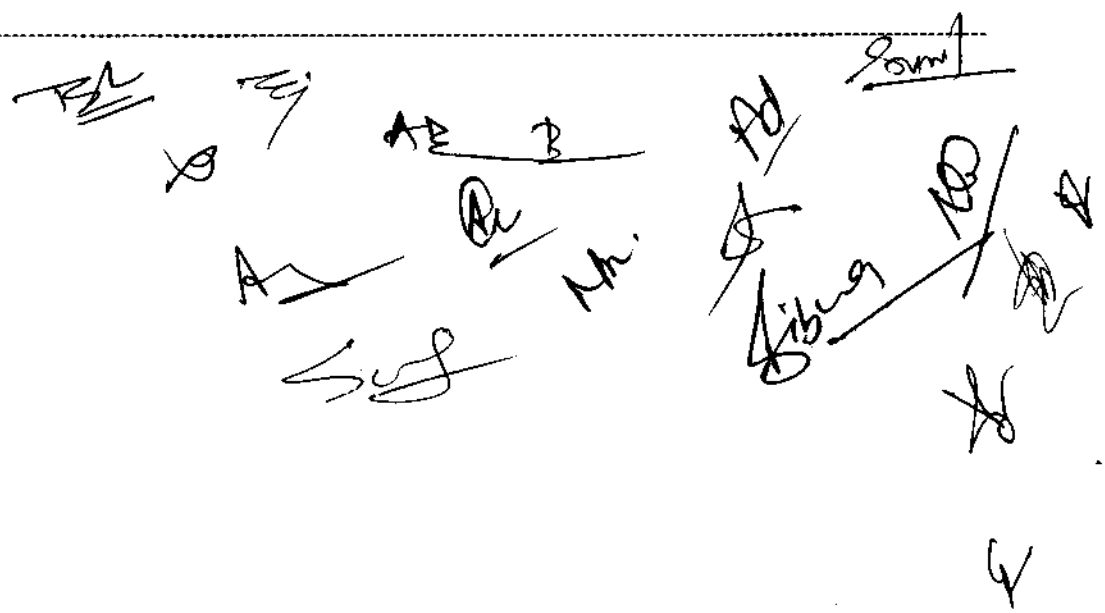
DEPARTMENT OF INFORMATION TECHNOLOGY

List of Mini Projects:

1. Write a program to evaluate any arithmetic expressions using STACK.
2. Write a program to implement priority queue for airport check in process.
3. Write a program to implement Music Player using Linked List.
4. Write a program to implement Online Voting System using a graph and linked list.
5. Write a program to design a Snakes game.
6. Design, Develop and Implement a menu driven Program for the following operations on Doubly Linked List (DLL) of Professor Data with the fields: ID, Name, Branch, Area of specialization
    a. Create a DLL stack of N Professor's Data.
    b. Create a DLL queue of N Professor's Data Display the status of DLL and count the number of nodes in it.



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DEPARTMENT OF INFORMATION TECHNOLOGY

PYTHON PROGRAMMING LAB
2160222/2230223/2240223/2270222/2280222

LIST OF PROGRAMS

1. Write a program to demonstrate different number data types in python.
2. Write a program to perform different arithmetic operations on numbers in python.
3. Write a program to create, concatenate and print a string and accessing substring from a given string.
4. Write a python program to create, append and remove lists in python.
5. Write a program to demonstrate working with tuples in python.
6. Write a program to demonstrate working with dictionaries in python.
7. Write a python program to find the factorial of a number using recursion.
8. WAP to swap two integers without using a third variable. The swapping must be done in a different method in a different class.
9. WAP to find the greater of two given numbers in two different classes using friend function.
10. Write a python program to define a module and import a specific function in that module to another program.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. write, test, and debug simple Python programs.

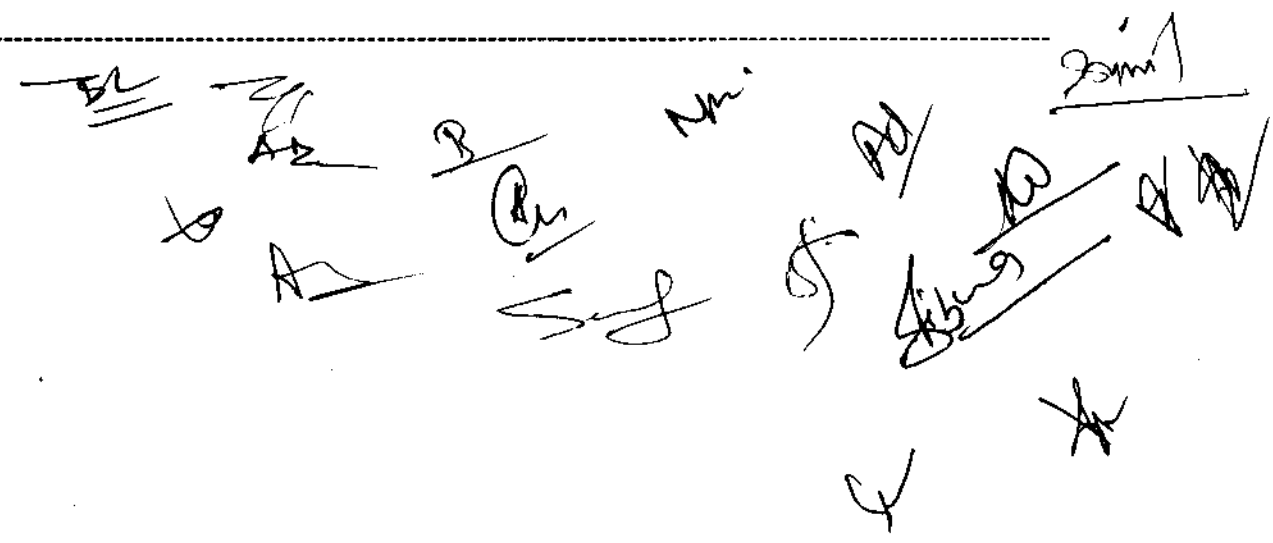
CO2. solve computational problem using python language.

CO3. familiar with basics syntax and features of python programming language.

CO4. use Python lists, tuples, dictionaries for representing compound data.

CO5. design a program utilizing the features of object oriented concept.

CO6. utilize some of the libraries available for solving problems.



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DEPARTMENT OF INFORMATION TECHNOLOGY

PYTHON PROGRAMMING LAB
2160222/2230223/2240223/2270222/2280222

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Write a python program that validates an email ID entered by the user, where the validation rules include that at least one character should be in lowercase and one in uppercase and contains at least one numeric character and one special symbol.
2. Implement countdown clock and timer in python.
3. Suppose a text file contains information about students in the form of Name, Enrolment, Semester, CGPA. Write a python script to display semester-wise student details in descending order of CGPA.

List of Macro Projects:

1. Suppose a text file contains information about students in the form of Name, 10th-class exam roll number, marks in physics, marks in chemistry and marks in mathematics. Write a python script to generate a text file containing subject-wise merit list.
2. Design and implementation of a real-time, User friendly Currency Converter.
3. Write a python program to create a Tic-Tac-Toe Game.

List of Mini projects:

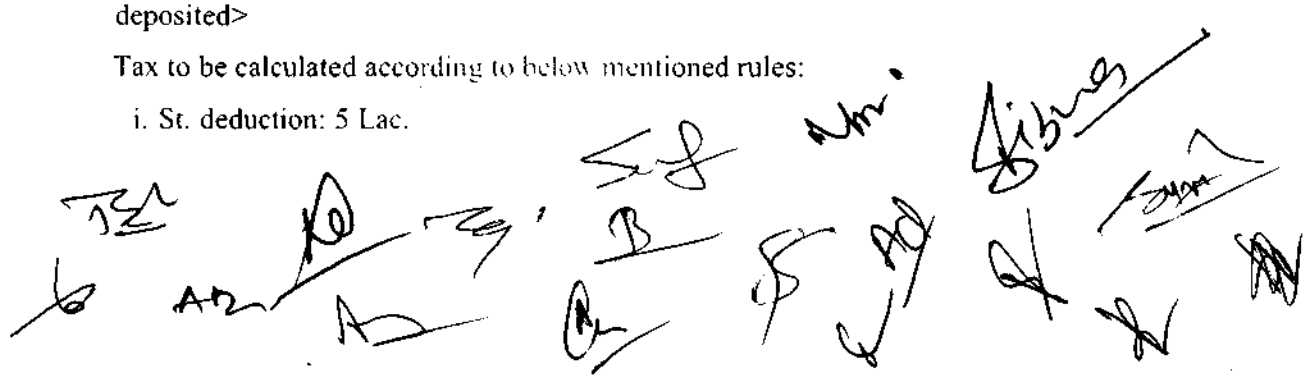
1. Create a login module with below mentioned features:
    a. Verify username and password correctly
    b. Register new user and set its password
    c. Change password of any registered user

Note: Store the usernames and passwords in a Dictionary.

2. Suppose a text file contains employee details in the form of comma separated values as: employee name, ID, gross salary, Annual Provident Fund deposited, Advance tax deposited. Write a python script to calculate annual tax detection for each employee and store details in:
    a. Dictionary, where key represents employee ID, value represents the net tax to be deposited by the employee.
    b. In a text file as: Name: <Employee Name>; ID: <Employee ID>; Tax: <Tax to be deposited>

    Tax to be calculated according to below mentioned rules:

    i. St. deduction: 5 Lac.



ii. 0 to 5 Lac: 5% tax deduction

iii. 5 to 7.5 Lac: 10% tax deduction

iv. 7.5 to 10 Lac: 15% tax deduction

v. Above 10 Lac: 20 % tax deduction

3. Write a program in python to represent a student using OOPS where each student is represented by name, ID, Semester and CGPA. The student class to be implemented should contain all the necessary functions appropriate according to a student. The class should contain 3 dictionary variables as static members which should contain a semester-wise topper list. The key in each dictionary should represent the student Merit position, and value should represent details of a particular student.

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DEPARTMENT OF INFORMATION TECHNOLOGY

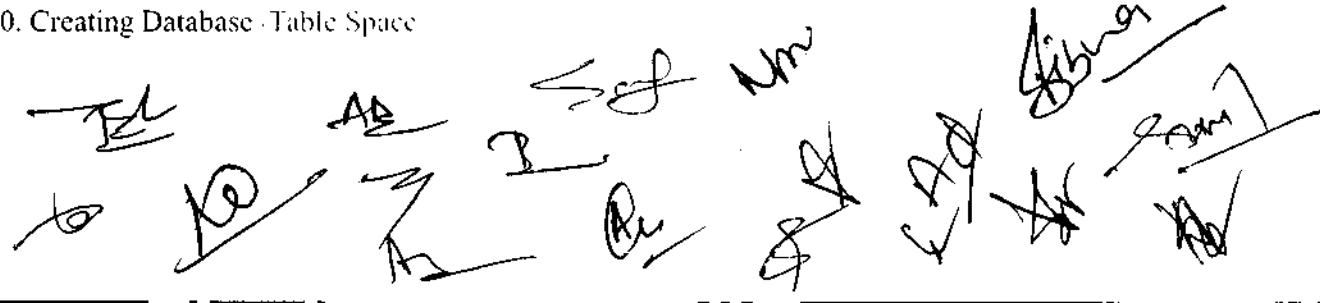
DATABASE MANAGEMENT SYSTEM
2160223/ 2230224/ 2240224/ 2270223/ 2280223

LIST OF PROGRAMS

While creating tables, databases the name should have a prefix of your roll number.

Ex. If your roll number is 55 then every table name must start with 55 TABLE_NAME. 1. Write program name 2. Write description of command used for executing the query. 3. Write commands in bold letters. 4. Take the screenshot of the output.

1. Implementation of DDL commands of SQL with suitable examples.
   a. Create table
   b. Alter table
   c. Drop Table
2. Implementation of DML commands of SQL with examples.
   a. Insert
   b. Update
   c. Delete
3. Implementation of different type of function with suitable example
   a. Number function
   b. Aggregate function
   c. Character function
   d. Conversion function
   e. Data function
4. Implementation of different type of operators in SQL.
   a. Arithmetic operators
   b. Logical operators
   c. Set operator
   f. Comparison Operator
   g. Special operator
5. Implementation of type of joins.
   a. Inner Join
   b. Outer Join
   c. Natural Join etc.
6. Study and implementation of
   a. Group by & having clause
   b. order By clause
   c. Indexing
7. Study of Implementation of
   a. Sub queries
   b. Views
8. Study & implementation of different type of constraints.
9. Study & implementation of database backup & recovery command. Study & implementation of Rollback, commit, savepoint.
10. Creating Database -Table Space



a. Managing Users: Create User, Delete User
b. Managing roles: Grant, Revoke.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. construct database schema for a given problem domain.

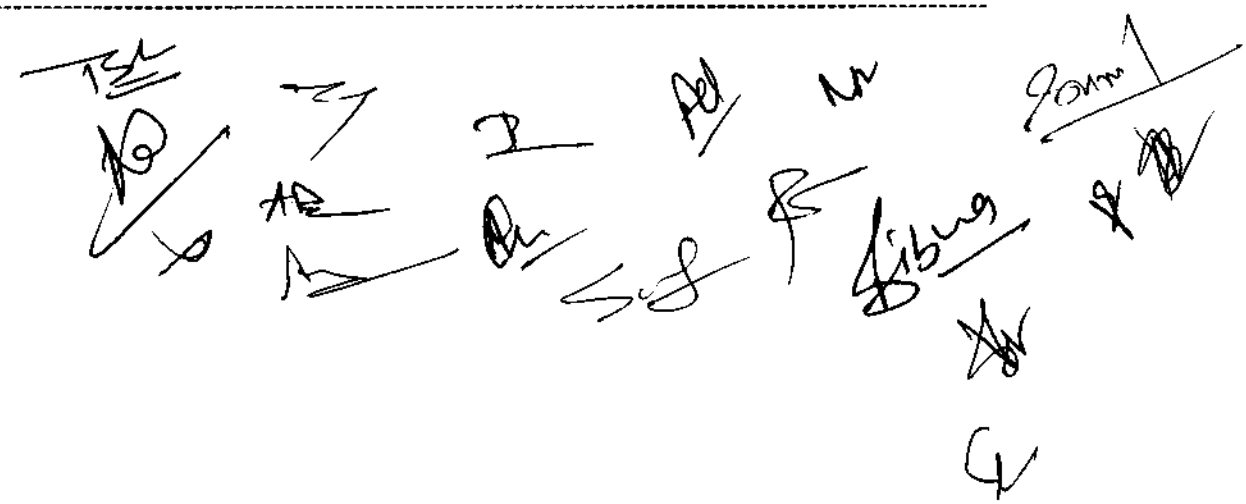
CO2. apply integrity constraints on a database schema using a state-of-the-art RDBMS.

CO3. apply SQL queries using DDL and DML to design and access database systems.

CO4. make use of operators and functions used in query.

CO5. distinguish Tables and Views for database systems.

CO6. develop a small project for a real world scenario.



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DEPARTMENT OF INFORMATION TECHNOLOGY

DATABASE MANAGEMENT SYSTEM
2160223/ 2230224/ 2240224/ 2270223/ 2280223

LIST OF SKILL BASED MINI PROJECT

- Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment.
- Design ER-Diagram, Create Schema and insert at least 5 records for each table. Add appropriate database constraints

Mini Skill Project 1

Consider the following schema for a Library Database:
BOOK (Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS (Book_id, Author_Name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Programme_id, No-of_Copies)
BOOK_LENDING (Book_id, Programme_id, Card_No. Date_Out, Due_Date)
LIBRARY_PROGRAMME (Programme_id, Programme_Name, Address)

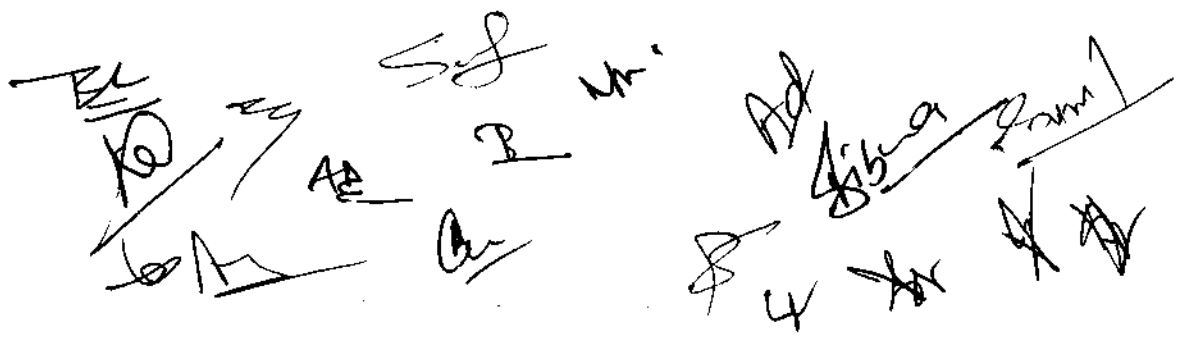
Write SQL queries to

1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc.
2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
5. Create a view of all books and its number of copies that are currently available in the Library.

Mini Skill Project 2

Consider the following schema for Order Database:
SALESMAN (Salesman_id, Name, City, Commission)
CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)
ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
Write SQL queries to

1. Count the customers with grades above Bangalore's average.
2. Find the name and numbers of all salesman who had more than one customer.
3. List all the salesman and indicate those who have and do not have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.



Mini Skill Project 3

Consider the schema for Movie Database:
ACTOR (Act_id, Act_Name, Act_Gender)
DIRECTOR (Dir_id, Dir_Name, Dir_Phone)
MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
MOVIE_CAST (Act_id, Mov_id, Role)
RATING (Mov_id, Rev_Stars)

Write SQL queries to

1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and in a movie after 2015 (use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

Mini Skill Project 4

Consider the schema for College Database:
STUDENT (USN, SName, Address, Phone, Gender)
SEMSEC (SSID, Sem, Sec)
CLASS (USN, SSID)
COURSE (Subcode, Title, Sem, Credits)
IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to

1. List all the student details studying in fourth semester 'C' section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion:
If FinalIA = 17 to 20 then CAT = 'Outstanding'
If FinalIA = 12 to 16 then CAT = 'Average'
If FinalIA< 12 then CAT = 'Weak'
Give these details only for 8th semester A, B, and C section students.

Mini Skill Project 5

Consider the schema for Company Database:
EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)
DLOCATION (DNo,DLoc)
PROJECT (PNo, PName, PLocation, DNo)
WORKS_ON (SSN, PNo, Hours)

Write SQL queries to

1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

Mini Skill Project 6

A university registrar's office maintains data about the following entities:
(a)courses, including number, title, credits, syllabus, and prerequisites;
(b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom;
(c) students, including student-id, name, and program; and
(d) instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled.
Construct an E-R diagram forthe registrar's office. Document all assumptions that you make about the mapping constraints.

Mini Skill Project 7

Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents.

Mini Skill Project 8

Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted.

Mini Skill Project 9

Design an E-R diagram for keeping track of the exploits of your favourite sports team. You should store the matches played, the scores in each match, the players in each match and individual player statistics for each match. Summary statistics should be modeled as derived attributes.

Mini Skill Project 10

Consider a database used to record the marks that students get in different exams of different course offerings.

a. Construct an E-R diagram that models exams as entities, and uses a ternary relationship, for the above database.

b. Construct an alternative E-R diagram that uses only a binary relationship between students and course-offerings. Make sure that only one relationship exists between a particular student and course-offering pair, yet you can represent the marks that a student gets in different exams of a course offering.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - XIII

Gaps in CO Attainment Levels for Session July - December 2022 Semester and Proposed Corrective Measures for Improvement (Information Technology/ Internet of Things (IoT)/ Artificial Intelligence and Robotics/ Artificial Intelligence & Data Science/ Artificial Intelligence & Machine Learning)

[ITEM IT-17]

Madhav Institute of Technology and Science, Gwalior

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Information Technology

CO Attainment of B. Tech. Information Technology

Session: Jul- Dec 2022

Semester	Course Name		Course outcomes	Direct Attainment %	Level of Direct Attainment	Indirect Attainment %	Level of Indirect Attainment	Overall level of Attainment	Target	Target of level	Gap	Attained/ Not Attained	Action Taken
Semester III	160311: CSO	CO1	recall the basic building blocks of computer Architecture	76	3.0	80.0	3.0	3.00	60	2	-1.00	[redacted]	Students are encouraged to observe, to gain insight into possible approaches/solutions/algorithms to real life problems.
		CO2	compare different memories	87.2	3.0	81.3	3.0	3.00	60	2	-1.00	[redacted]	
		CO3	concept of memory mapping, multiprocessor and pipelining in solving real world problems	67.2	2.7	79.3	3.0	2.78	60	2	-0.78	[redacted]	
		CO4	analyze various modes of Input-Output data transfer	62.4	2.2	78.7	3.0	2.39	60	2	-0.39	[redacted]	Research oriented mini skill projects are encouraged to develop and hone their research skills.
		CO5	evaluate the arithmetic related to the number system	58.4	1.8	78.7	3.0	2.07	60	2	-0.07	[redacted]	
		CO6	develop the skill of writing low level programming	60.8	2.1	76.7	3.0	2.26	60	2	-0.26	[redacted]	more practical approach and problems will be introduced with students.
	160312: DAA	CO1	Tell the basic features of an Algorithms	76.8	3.0	81.1	3.0	3.00	65	2.5	-0.50	[redacted]	Higher order thinking question related to algorithms and data structures will be included in examination.
		CO2	Demonstrate a familiarity with major Algorithms and Data Structures	73.6	3.0	78.4	3.0	3.00	65	2.5	-0.50	[redacted]	More complex assignments and tutorials design paradigms and methods of analysis are to be given to students for better understanding.
		CO3	Apply important algorithmic design paradigms and methods of analysis	66.4	2.6	76.6	3.0	2.71	65	2.5	-0.21	[redacted]	Beyond the syllabus, some practical problem of analyze the performance of algorithms will provide to students during class session and discuss important facts related to problem.
		CO4	Analyze the asymptotic performance of Algorithms	77.6	3.0	79.3	3.0	3.00	65	2.5	-0.50	[redacted]	More complex examples in class room session should be discussed, this will help to student to compare various algorithm design techniques.
		CO5	Compare different design techniques to develop algorithms for computational problems.	79.2	3.0	82.0	3.0	3.00	65	2.5	-0.50	[redacted]	Discuss more practical examples in class room session and numerical problems will dicuss.
		CO6	Design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking, branch and bound approach	80.0	3.0	76.6	3.0	3.00	65	2.5	-0.50	[redacted]	Real world problem will discuss to student and ask them to apply concept in different engineering applications.
	160313: DBMS	CO1	Demonstrate the concept on different type of database system.	76.8	3.0	86.5	3.0	3.00	65	2.5	-0.5	[redacted]	Higher order thinking question related to algorithms and data structures will be included in examination.
		CO2	Apply Relational algebra concepts to design database system	73.6	3.0	85.6	3.0	3.00	65	2.5	-0.5	[redacted]	More complex assignments and tutorials design paradigms and methods of analysis are to be given to students for better understanding.
		CO3	Make use of queries to design and access database system,	66.4	2.6	85.6	3.0	2.71	65	2.5	-0.21	[redacted]	Beyond the syllabus, some practical problem of analyze the performance of algorithms will provide to students during class session and discuss important facts related to problem.
		CO4	Analyze the evaluation of transaction processing and concurrency control.	77.6	3.0	82.0	3.0	3.00	65	2.5	-0.5	[redacted]	More complex examples in class room session should be discussed, this will help to student to compare various algorithm design techniques.
		CO5	Determine the optimize database for real world applications.	79.2	3.0	83.8	3.0	3.00	65	2.5	-0.5	[redacted]	Discuss more practical examples in class room session and numerical problems will dicuss.
		CO6	Design a database system for a real world application,	80.0	3.0	82.0	3.0	3.00	65	2.5	-0.5	[redacted]	Real world problem will discuss to student and ask them to apply concept in different engineering applications.
	160314: OS	CO1	Outline the basic concept of operating systems	73.6	3	75.36	3	3.0	60	3	0	[redacted]	Students should be made to solve more complex problems of compiler
		CO2	Analyze the working of operating system	73.6	3	73.91	3	3.0	60	3	0	[redacted]	More practical based topics should be included in the curriculum
		CO3	Examine the working of various scheduling/allocation approaches	68.8	3	81.16	3	3.0	60	3	0	[redacted]	Target level should be improved
		CO4	Measure the performance of various scheduling/allocation approaches	69.6	3	78.26	3	3.0	60	3	0	[redacted]	Target level should be improved
		CO5	Compare the various operating system problems/issues	69.6	3	75.36	3	3.0	60	3	0	[redacted]	Lab experiment list of the subject should be revised
		CO6	Develop the Solution of various operating system problems/issues	60	3	72.46	3	3.0	60	3	0	[redacted]	Project based learning should be included in the subject
	160511: Discrete Structure	CO1	Judge various model of computation.	96.00	3.0	93.00	3.00	3.00	60	3.00	0	[redacted]	Level of questions should be improved.
		CO2	Construct abstract models of computing	95.00	3.0	93.00	3.00	3.00	60	3.00	0	[redacted]	More projects on solving complex problems will be included.
		CO3	Infer the power of abstract models in computing to recognize the languages.	88.00	3.0	87.00	3.00	3.00	60	3.00	0	[redacted]	Mini projects given to students are quite complex to help them in understanding complex problems.
		CO4	Demonstrate analytical thinking and intuition for problem solving situations in related areas of theory of computation	80.00	3.0	87.00	3.00	3.00	60	3.00	0	[redacted]	More HOT questions should be added
		CO5	Explain the limitations of computation in solving problems	96.00	3.0	93.00	3.00	3.00	60	3.00	0	[redacted]	Discussed extra Tutorial- sheets
		CO6	Define set of rules for syntax verification	92.00	3.0	37.00	3.00	3.00	60	3.00	0	[redacted]	Level of questions should be improved.

Semester V	160512: Data Science Using Python	CO1	Define the fundamentals of data science and its importance.	66.4	2.6	71.00	3.00	2.68	60	2.5	-0.18		Level of target should be improved.
		CO2	Contrast the basics of python and libraries related to data science	65.00	2.5	67.00	3.00	2.60	60	2.5	-0.10		More practical approach and problems would be introduced with students.
		CO3	Classify different types of data analytics	67.00	3.0	68.00	2.8	2.96	60	2.5	-0.46		More projects on software development would be included.
		CO4	Organize the data collected from various sources	69.00	2.9	68.00	2.8	2.88	60	2.5	-0.38		Real life Projects can be assigned to improve the software development.
		CO5	Analyze pre-processing and data reduction strategies	69.00	2.9	69.00	2.9	2.90	60	2.5	-0.40		Level of target should be improved.
		CO6	create the graphical representation of the data through visualization tool on various applications.	83.00	3.0	68.00	2.8	2.96	60	2.5	-0.46		Additional guest lectures and workshops are conducted to educate students on modern IT tools.
	160513: TOC	CO1	Explain the basic concepts of switching and finite automata theory and languages.	66.4	3.0	85.5	3.0	2.92	60	3.0	-0.21		Higher order thinking question related to finite automata theory and languages will be included in examination.
		CO2	Relate practical problems to languages, automata, computability, and complexity	70.4	3.0	87.0	3.0	3.00	60	3.0	-0.5		More complex assignments and tutorials of automata and CFG are to be given to students for better understanding.
		CO3	Construct abstract models of computing and analyse their power to recognize the languages.	80.8	3.0	82.6	3.0	3.00	60	3.0	-0.5		Beyond the syllabus, some practical problem of formal languages recognize will provide to students during class session and discuss important facts related to problem.
		CO4	Construct and analyze the grammar	63.2	3.0	82.6	3.0	3.0	60	3.0	0.0		More complex examples in class room session should be discussed, this will help to student to analyze the grammer, its type and also simplify different compitative problems.
		CO5	Apply mathematical models and descriptors in various computing theories	68.0	3.0	81.2	3.0	3.00	60	3.0	-0.34		Discuss more practical examples in class room session and numerical problems will dicuss.
		CO6	Solve problems in computer science using mathematical and formal techniques	65.6	3.0	79.7	3.0	3.00	60	3.0	-0.15		Real world problem will discuss to student and ask them to apply concept of TOC in different engineering applications.
	160514: MP&I	CO1	compare the architecture and feature of different 16-bit microprocessor interfacing chips & microcontrollers.	67.2	3.0	79	3.0	3.00	60	3.0	0		level of questions improved for more COs
		CO2	develop programming skills in assembly language of 8086 microprocessor and 8051 microcontroller	66.8	3.0	81	3.0	3.00	60	3.0	0		Discuss more practical examples in class room session and numerical problems will dicuss.
		CO3	demonstrate the concept of interfacing with peripheral devices	56.8	3.0	79	3.0	3.00	60	3.0	0		level of questions improved for more COs
		CO4	make use of different interrupts and addressing modes.	68.8	3.0	79	3.0	3.00	60	3.0	0		Target level should be improved
		CO5	design an interfacing for I/O devices	56	3.0	77	3.0	3.00	60	3.0	0		Discussed for achieved more direct COs
		CO6	build a system based on 8086 microprocessor and 8051 microcontroller.	43.2	3.0	81	3.0	3.00	60	3.0	0		level of questions improved for more COs
	160515: Soft Computing Technique	CO1	define basic concepts of neural network and fuzzy systems.	68	2.6	76	3.0	3.00	70	3.0	0		More HOT questions should be added
		CO2	compare solutions by applying various soft computing approaches on a given problem.	66	2.6	66	2.6	2.92	70	3.0	0		More HOT questions should be added
		CO3	develop and train different supervised and unsupervised learning.	65	2.5	72	3.0	2.68	67	3.0	0		Arrangement of Remedial Classes
		CO4	classify various nature inspired algorithms according to their application aspect.	66	2.8	65	2.5	2.58	67	3.0	0		More HOT questions should be added
		CO5	compare the efficiency of various hybrid systems.	77	3.0	63	2.5	2.50	67	3.0	0		Discuss extra Tutorial- sheets
		CO6	design a soft computing model for solving real world problems.	78	3.0	66	2.6	2.76	69	3.0	0		More HOT questions should be added
Semester VII	160705: Mobile Computing	CO1	explain the basic concepts of mobile telecommunications system	69	2.9	76	3.0	2.92	65	2.7	-0.22		Students should be made to solve more complex problems of compiler
		CO2	demonstrate the infrastructure to develop mobile communications system	72	3.0	66	2.6	2.92	65	2.7	-0.22		More practical based topics should be included in the curriculum
		CO3	classify the different generations and technology for mobile communications	72	3.0	72	3.0	3.00	65	2.7	-0.30		Target level should be improved
		CO4	examine the working of different protocols of wireless mobile communication technology	71	3.0	65	2.5	2.90	65	2.7	-0.20		Target level should be improved
		CO5	determine the importance of each technology suitable for different situation of mobile and wireless communications	73	3.0	65	2.5	2.90	65	2.7	-0.20		Lab experiment list of the subject should be revised
		CO6	develop protocols for adhoc and infrastructure based wireless networks	70	3.0	66	2.6	2.92	65	2.7	-0.22		Project based learning should be included in the subject
	160706 Soft Computing	CO1	define basic concepts of neural network and fuzzy systems.	65	2.5	66.7	2.7	2.53	60	2	-0.53		More tough quiz and assignment should be given to access the student
		CO2	compare solutions by applying various soft computing approaches on a given problem	83	3.0	68.1	2.8	2.96	60	2	-0.96		More practical based problems should be included in the curriculum
		CO3	develop and train different supervised and unsupervised learning	59	1.9	69.6	3.0	2.11	60	2	-0.11		Project based learning should be included in the subject
		CO4	classify various nature inspired algorithms according to their application aspect	59	1.9	66.7	2.7	2.05	60	2	-0.05		Target level should be improved
		CO5	compare the efficiency of various hybrid systems	51	1.1	66.7	2.7	1.41	60	2	0.587		More HOT questions should be added
		CO6	design a soft computing model for solving real world problems.	52	1.2	73.9	3.0	1.56	60	2	0.44		more practical approach and problems will be introduced with students.

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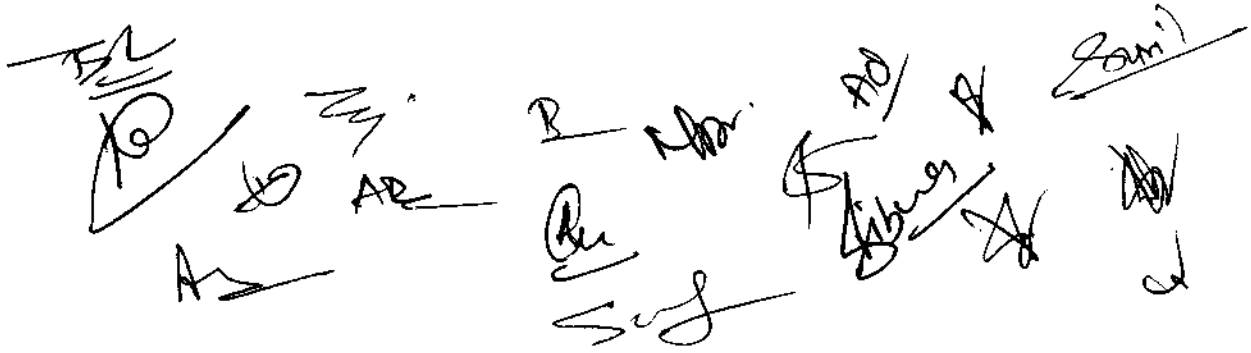
Department of Information Technology

Session: July - Dec 2022

Semester III

Course Name	COs	Course outcomes	Direct Attainment %	Level of Direct Attainment	Indirect Attainment %	Level of Indirect Attainment	Overall Attainment %	Overall level of Attainment	Target	Target level	Gap	Attained/ Not Attained	Action Taken
Design and Analysis of Algorithm (230501)	CO1	demonstrate a familiarity with major algorithms and data structures	74.40	3.0	75.0	3	75	3.0	60	2	-1.0		More higher order thinking and logical question should be included and target Level will be increased
	CO2	idenify important algorithmic design paradigms and methods of analysis	70.40	3.0	69.4	3	70	3.0	60	2	-1.0		
	CO3	analyze the performance of algorithms	71.20	3.0	72.2	3	71	3.0	60	2	-1.0		
	CO4	compare various algorithm design techniques	76.00	3.0	71.3	3	75	3.0	60	2	-1.0		
	CO5	select the design technique to solve any real world problem	66.40	2.6	71.3	3	67	2.7	60	2	-0.7		
	CO6	design efficient algorithm using various design techniques	76.00	3.0	70.4	3	75	3.0	60	2	-1.0		
operating system (230502)	CO1	tell the basic concept of operating systems	85.5	3.0	72.8	3	75	3.0	60	2	-1.0		More no. of questions added in end sem
	CO2	explain the working procedure of the operating system	87.0	3.0	72.8	3	76	3.0	60	2	-1.0		
	CO3	analyze the various operating system problems and issues	82.6	3.0	72.8	3	75	3.0	60	2	-1.0		
	CO4	develop the solutions for various operating system problems and issues	82.6	2.1	60.8	3	65	2.5	60	2	-0.5		
	CO5	measure the performance of various scheduling and allocation techniques	81.2	2.1	60.8	3	65	2.5	60	2	-0.5		
	CO6	test the working of various scheduling and allocation techniques	79.7	2.1	60.8	3	65	2.5	60	2	-0.5		
Computer networks and Protocols (230503)	CO1	explain the fundamental concepts of computer network	95.2	3.0	76.0	3	91	3.0	70	3	0.0		Try to increase attainment level and Target level may be increase
	CO2	illustrate the basic taxonomy & terminologies of computer network protocols	68.0	2.8	74.7	3	69	2.9	70	3.0	0.1		
	CO3	develop a concept for understanding advance computer network	70.4	3.0	76.0	3	72	3.0	70	3.0	0.0		
	CO4	build the skill of IP addressing and routing mechanism	95.2	3.0	73.3	3	91	3.0	70	3.0	0.0		
	CO5	predict the performance of computer network in congestion and internet	86.4	3.0	74.7	3	84	3.0	70	3.0	0.0		
	CO6	construct the network environment for implementation of computer networking concept	70.4	3.0	74.7	3	71	3.0	70	3.0	0.0		
Database management Systems(230504)	CO1	demonstrate the concepts of different types of database system	59.00	1.9	85.5	3	64	2.4	60	2	[illegible]		Concepts of different database system will be assigned with relational algebra concept. Also. Target level will be increased
	CO2	apply relational algebra concepts to design database system	65.00	2.5	78.3	3	68	2.8	60	2	-0.8		
	CO3	make use of queries to design and access database system	70.00	3.0	78.3	3	79	3.0	60	2	-1.0	[illegible]	
	CO4	analyze the evaluation of transaction processing and concurrency control	70.00	3.0	78.3	3	72	3.0	60	2	-1.0	[illegible]	
	CO5	determine the normal form of the relation	61.00	2.1	84.1	3	66	2.6	60	2	-0.6	[illegible]	
	CO6	design a ER diagram/database system for a real world application	61.00	2.1	76.8	3	64	2.4	60	2	-0.4	[illegible]	
Discrete structure (230501)	CO1	explain the basic concept of set theory, propositional logic, graph theory, discrete numeric function and algebraic structure	73.60	3.0	88.9	3	77	3.0	60	2	-2.0		Level of Target needs to be improved. all Cos are attained comprehensively
	CO2	illustrate the knowledge of [illegible]	[illegible]	3.0	85.7	3	82	3.0	[illegible]	2	[illegible]	Attained	
	CO3	identify the concepts of graph and [illegible] problems in the computer science	95.60	3.0	85.7	3	92	3.0	[illegible]	2	[illegible]	Attained	
	CO4	apply the concepts of studied topics [illegible] technique faced in engineering Problems	87.20	3.0	85.7	3	87	3.0	[illegible]	[illegible]	[illegible]	Attained	
	CO5	analyze the set theory, propositional [illegible] discrete numeric function [illegible] examine the real world problem	[illegible]	3.0	85.7	3	91	3.0	[illegible]	2	[illegible]	Attained	
	CO6	build analytical skill and interpret [illegible] engineering beneficial in real time [illegible]	[illegible]	3.0	84.1	3	85	3.0	[illegible]	2	[illegible]	Attained	
Data science, in IoT (230502)	CO1	define the fundamentals of data science and its importance	[illegible]	3.0	85.5	3	79	3.0	[illegible]	2	[illegible]	Attained	All Cos are attained Target for the attainmets should be improved
	CO2	classify the evolution, roles, stages in data science projects	80	3.0	87.0	3	81	3.0	60	2	-2.0	Attained	
	CO3	analyze the pre-processing and data reduction strategies	93.6	3.0	82.6	3	91	3.0	60	2	-1.0	Attained	
	CO4	explain the different data visualization [illegible] representation techniques	75.2	3.0	82.6	3	[illegible]	3.0	[illegible]	[illegible]	[illegible]	Attained	
	CO5	evaluate the performance of algorithm [illegible]	72	3.0	81.2	3	74	3.0	[illegible]	[illegible]	[illegible]	Attained	
	CO6	design the different real time applications of data science in IoT	75.2	3.0	79.7	3	76	3.0	[illegible]	[illegible]	[illegible]	Attained	

	CO1	explain the basic concepts of switching and finite automata theory & languages	73.6	3.0	100.0	3	79	3.0	60	2	-1.0	More higher order thinking and logical questions should be included.
	CO2	relate practical problems to languages, automata, computability and complexity	73.6	3.0	75.4	3	74	3.0	60	2	-1.0	
	CO3	construct abstract models of computing and check their power to recognize the languages	68.8	2.9	73.9	3	70	3.0	60	2	-1.0	
	CO4	analyze the grammar, its types, simplification and normal form	69.6	3.0	81.2	3	72	3.0	60	2	-1.0	
	CO5	interpret rigorously formal mathematical methods to prove properties of languages,grammars and automata	69.6	3.0	78.3	3	71	3.0	60	2	-1.0	
	CO6	develop an overview of how automata theory, languages and computation are	60	2.0	75.4	3	63	2.3	60	2	-0.3	
	CO1	define the basic concepts of embedded systems and microcontroller	87.2	3.0	78.0	3	85	3.0	60	2	-1.0	More practical approaches and problems will be provided
	CO2	explain the architecture and advanced features of embedded processors and microcontrollers	84.8	3.0	76.7	3	83	3.0	60	2	-1.0	
	CO3	utilize the PIC/ARM processor registers, instruction pipeline, interrupts and architecture	83.2	3.0	74.2	3	81	3.0	60	2	-1.0	
	CO4	examine the instructions, addressing modes, conditional instructions and programming of advanced embedded processors and microcontrollers	67.2	2.7	75.5	3	69	2.9	60	2	-0.9	
	CO5	analyze the architectures, instructions, interfacing and applications of Raspberry Pi board	68	2.8	76.1	3	70	3.0	60	2	-1.0	
	CO6	elaborate the advanced intel Galileo or Edison microprocessors for embedded systems	68.8	2.9	71.1	3	69	2.9	60	2	-0.9	
	CO1	define basic concepts of neural network and fuzzy systems	66.4	2.6	85.5	3	70	3.0	60	2	-1.0	level of target will be incresed and more complex problems will be assigned
	CO2	compare solutions by applying various soft computing approaches on a given problem	70.4	3.0	87.0	3	74	3.0	60	2	-1.0	
	CO3	develop and train different supervised and unsupervised learning	80.8	3.0	82.6	3	81	3.0	60	2	-1.0	
	CO4	classify various nature inspired algorithms according to their application aspect	64.8	2.5	84.1	3	69	2.9	60	2	-0.9	
	CO5	compare the efficiency of various hybrid systems	68	2.8	82.6	3	71	3.0	60	2	-1.0	
	CO6	design a soft computing model for solving real world problems	80.8	3.0	81.2	3	81	3.0	60	2	-1.0	



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Department of Information Technology

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Semester	Course Name	COs	Course outcomes	Direct Attainment %	Level of Direct Attainment	Indirect Attainment %	Level of Indirect Attainment	Overall Attainment %	Overall level of Attainment	Target	Target of level	Gap	Attained/Not Attained	Action Taken
Semester III	(240301) Design, analysis and algorithms	CO1	demonstrate a familiarity with major algorithms and data structures	74.40	3	75.00	3	75	3.0	60	2	-1	[redacted]	More higher order thinking and logical question should be included
		CO2	identify important algorithmic design paradigms and methods of analysis	70.40	3	69.44	3	70	3.0	60	2	-1	[redacted]	
		CO3	analyze the performance of algorithms	71.20	3	72.22	3	71	3.0	60	2	-1	[redacted]	
		CO4	compare various algorithm design techniques	76.00	3	71.30	3	75	3.0	60	2	-1	[redacted]	
		CO5	select the design technique to solve any real world problem	66.40	2.64	71.30	3	67	2.7	60	2	-1	[redacted]	
		CO6	design efficient algorithm using various design techniques	76.00	3	70.37	3	75	3.0	60	2	-1	[redacted]	
	operating system (240302)	CO1	tell the basic concept of operating systems	85.5	3	72.80	3	83	3.0	60	2	-1	[redacted]	more no. of questions added in end sem
		CO2	explain the working procedure of the operating system	87.0	3	72.80	3	84	3.0	60	2	-1	[redacted]	
		CO3	analyze the various operating system problems and issues	82.6	3	72.80	3	81	3.0	60	2	-1	[redacted]	
		CO4	develop the solutions for various operating system problems and issues	82.6	3	60.80	3	78	3.0	60	2	-1	[redacted]	
		CO5	measure the performance of various scheduling and allocation techniques	81.2	3	60.80	3	77	3.0	60	2	-1	[redacted]	
		CO6	test the working of various scheduling and allocation techniques	79.7	3	60.80	3	76	3.0	60	2	-1	[redacted]	
	Computer Networks & Protocols(240303)	CO1	explain the fundamental concepts of computer network	95.20	3	76.00	3	91	3.0	60	2	-1	[redacted]	Try to increase attainment level and Target level may be increase to imrove the performance at CO 2
		CO2	illustrate the basic taxonomy & terminologies of computer network protocols	68.00	2.8	74.67	3	69	2.9	60	2	-1	[redacted]	
		CO3	develop a concept for understanding advance computer network	70.40	3	76.00	3	72	3.0	60	2	-1	[redacted]	
		CO4	build the skill of IP addressing and routing mechanism	95.20	3	73.33	3	91	3.0	60	2	-1	[redacted]	
		CO5	predict the performance of computer network in congestion and internet	86.40	3	74.67	3	84	3.0	60	2	-1	[redacted]	
		CO6	construct the network environment for implementation of computer networking concept	70.40	3	74.67	3	71	3.0	60	2	-1	[redacted]	
	Database management Systems(240304)	CO1	demonstrate the concepts of different types of database system	59	1.9	85.50725	2	64	2.4	60	2	0	[redacted]	concepts of different database system will be assigned with relational algebra concept. Also, Target level will be increased
		CO2	apply relational algebra concepts to design database system	65	2.5	78.26087	3	68	2.8	60	2	-1	[redacted]	
		CO3	make use of queries to design and access database system	79	3	78.26087	3	79	3.0	60	2	-1	[redacted]	
		CO4	analyze the evaluation of transaction processing and concurrency control	70	3	78.26087	3	72	3.0	60	2	-1	[redacted]	
		CO5	determine the normal form of the relation	61	2.1	84.05797	2	66	2.6	60	2	-1	[redacted]	
		CO6	design a ER diagram database system for a real world application	61	2.1	76.81159	2	64	2.4	60	2	0	[redacted]	
Semester V	Discrete structure (240501)	CO1	explain the basic concept of set theory, propositional logic, graph theory, discrete numeric function and algebraic structure	73.6	3	88.88889	3	77	3.0	60	2	-1	[redacted]	Level of Target needs to be improved, all Cos are attained comprehensively
		CO2	illustrate the knowledge of course content and distinguish between them in terms of their applications	80.8	3.0	85.7	3	82	3.0	60	2.0	-1	[redacted]	
		CO3	identify the concepts of graph and tree for solving problems in the computer science	93.6	3.0	85.7	3	92	3.0	60	2.0	-1	[redacted]	
		CO4	apply the concepts of studied topics with suitable technique faced in engineering Problems	87.2	3.0	87.3	3	87	3.0	60	2.0	-1	[redacted]	
		CO5	analyze the set theory, propositional logic, graph theory, discrete numeric function and algebraic structure to examine the real world problem	92.8	3.0	85.7	3	91	3.0	60	2.0	-1	[redacted]	
		CO6	build analytical skill and interpret applications of engineering beneficial in real time troubleshooting	82.4	3.0	84.1	3	83	3.0	60	2.0	-1	[redacted]	
	Datasciences using Python(240502)	CO1	define the fundamentals of data science and its importance	71.20	3	86	3	74	3.0	60	2	-1	[redacted]	More complex assignments, small projects and tutorials of data science are to be given to students for better understanding
		CO2	classify the evolution, roles, stages in data science process	80.00	3	87	3	[illegible]	[illegible]	60	2	-1	[redacted]	
		CO3	analyze the pre-processing and data reduction strategies	80.00	3	83	3	81	3.0	60	2	-1	[redacted]	
		CO4	explain the different data visualization and representation techniques	93.60	3	83	3	92	[illegible]	60	2	-1	[redacted]	
		CO5	evaluate the performance of algorithms in data science	75.00	3	81	3	[illegible]	[illegible]	60	2	-1	[redacted]	
		CO6	design the different real time applications of data science [illegible]	73.60	3	80	3	74	[illegible]	60	2	-1	[redacted]	
	Theory of computation (240503)	CO1	explain the basic concept of switching and finite [illegible]	95.2	3	76	3	[illegible]	[illegible]	60	2	-1	[redacted]	Simulation of computer network environment and analysis is required
		CO2	[illegible] languages and [illegible] [illegible]	[illegible]	2.8	74.6	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[redacted]	
		CO3	[illegible] of computing and check their [illegible] languages	76.4	3	76	3	[illegible]	[illegible]	60	2	[illegible]	[redacted]	
		CO4	[illegible] simplification and normal [illegible]	95.2	3	73.24	3	[illegible]	[illegible]	60	2	[illegible]	[redacted]	
		CO5	[illegible] mathematical methods to [illegible]	[illegible]	3	74.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[redacted]	
		CO6	[illegible]	[illegible]	3	74.6	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[redacted]	
	Robotics and system Control (240504)	CO1	[illegible] embedded systems and [illegible]	[illegible]	3	81.16	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[redacted]	Target level has achieved. In next course of actions level of questions will be increased along with increasing the target
		CO2	[illegible] based control of [illegible] microcontroller	[illegible]	3	79.71	[illegible]	[illegible]	[illegible]	[illegible]	2	-1	[redacted]	
		CO3	[illegible] registers, instruction [illegible] architecture	73.6	3	79.71	[illegible]	[illegible]	[illegible]	[illegible]	2	-1	[redacted]	
		CO4	to explain issues of Trajectory planning in robotics and its [illegible]	77.6	3	82.61	3	79	[illegible]	60	2	-1	[redacted]	
		CO5	[illegible] motion planning and robot application	69.6	2.96	79.71	3	72	[illegible]	60	2	-1	[redacted]	
		CO6	[illegible] concept of algorithm for intelligent system and [illegible]	74.4	3	79.71	3	75	[illegible]	60	2	-1	[redacted]	
	Soft Computing Techniques (250505)	CO1	[illegible] neural network and fuzzy [illegible]	66.40	2.64	86	[illegible]	[illegible]	[illegible]	[illegible]	2.5	-1	[redacted]	Target level has achieved. In next course of actions level of questions will be increased along with increasing the target
		CO2	[illegible] applying various soft computing [illegible]	70.40	3	87	[illegible]	[illegible]	[illegible]	[illegible]	2.5	-1	[redacted]	
		CO3	[illegible] supervised and unsupervised [illegible]	80.80	3	83	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1	[redacted]	
		CO4	[illegible] algorithms according to [illegible]	64.80	2.48	84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	[redacted]	
		CO5	[illegible] hybrid systems	[illegible]	2.8	85	[illegible]	[illegible]	[illegible]	[illegible]	2.5	[illegible]	[redacted]	
		CO6	[illegible] for solving real world [illegible]	80.80	3	81	[illegible]	[illegible]	[illegible]	[illegible]	2.5	-1	[redacted]	

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Semester	Course Name		Course outcomes	Level of Direct Attainment	Level of Indirect Attainment	Overall level of Attainment	Target of level	Gap	Attained/ Not Attained	Action Taken
Semester III	270302 Design & analysis of Algorithms	CO1	demonstrate a familiarity with major algorithms and data structures	3	3	3	2.5	-0.5	Attained	Subsequent extra classes should be conducted beyond the regular planned classes.
		CO2	identify important algorithmic design paradigms and methods of analysis	2.88	3	2.9	2.5	-0.4	Attained	Discuss more practical examples in class room session
		CO3	analyze the performance of algorithms.	2.48	3	2.6	2.5	-0.08	Attained	Subsequent extra classes should be conducted beyond the regular planned classes.
		CO4	compare various algorithm design techniques.	3	3	3	2.5	-0.5	Attained	Extra Tutorial- sheets will discuss with students during extra classes.
		CO5	select the design technique to solve any real world problem.	3	3	3	2.5	-0.5	Attained	More practical problem should be given to student implementing
		CO6	design efficient algorithm using various design techniques.	3	3	3	2.5	-0.5	Attained	Discuss more practical examples in class room session
	270303 Operating System	CO1	define the basic concept of operating systems	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO2	explain the working procedure of the operating system.	3	3	3	2	-1	Attained	Extra Tutorial- sheets will discuss with students during extra classes
		CO3	analyze the various operating system problems and issues.	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO4	determine the solutions for various operating system problems and issues.	3	2.8	3	2	-0.96	Attained	Extra Tutorial- sheets will discuss with students during extra classes
		CO5	evaluate the performance of various scheduling and allocation techniques.	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO6	[illegible] the working of various scheduling and allocation techniques.	3	2.8	3	2	-0.96	Attained	Subsequent extra classes should be conducted beyond the regular planned classes.
	270304 Computer Networks and protocol	CO1	explain the fundamental concepts of computer network.	3	3	3	2.5	-0.5	Attained	Discuss more practical examples in class room session
		CO2	illustrate the basic taxonomy & terminologies of computer network protocols	2.56	3	2.6	2.5	-0.15	Attained	Discuss more practical examples in class room session
		CO3	develop a concept for understanding advance computer network	2.48	3	2.6	2.5	-0.08	Attained	Extra Tutorial- sheets will discuss with students during extra classes.
		CO4	build the skill of IP addressing and routing mechanism.	3	3	3	2.5	-0.5	Attained	
		CO5	predict the performance of computer network in congestion and internet.	1.6	3	1.9	2.5	0.62		Discuss more practical examples in class room session
		CO6	construct the network environment for implementation of computer networking concept	1.68	3	1.9	2.5	0.56		More practical problem should be given to student implemen
	270305 Database management System	CO1	demonstrate the concepts of different types of database system.	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO2	apply relational algebra concepts to design database system	3	3	3	2	-1	Attained	Discuss more programming solutions to student for analysing programming problems
		CO3	make use of queries to design and access database system	3	3	3	2	-1	Attained	Extra Tutorial- sheets will discuss with students during extra classes
		CO4	analyze the evaluation of transaction processing and concurrency control	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO5	determine the normal form of the schema	3	3	3	2	-1	Attained	More practical problem should be given to student
		CO6	[illegible] ER diagram database system for real world application	3	3	3	2	-1	Attained	

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Semester	Course Name		Course outcomes	Level of Direct Attainment	Level of Indirect Attainment	Overall level of Attainment	Target level	Gap	Attained/ Not Attained	Action Taken
Semester III	180302 Design & analysis of Algorithms	CO1	demonstrate a familiarity with major algorithms and data structures	3	3	3	2.5	-0.5	Attained	Subsequent extra classes should be conducted beyond the regular planned classes.
		CO2	identify important algorithmic design paradigms and methods of analysis.	3	3	3	2.5	-0.5	Attained	Discuss more practical examples in class room session
		CO3	analyze the performance of algorithms	2.64	3	2.71	2.5	-0.212	Attained	Extra Tutorial- sheets will discuss with students during extra classes
		CO4	compare various algorithm design techniques.	3	3	3	2.5	-0.5	Attained	Extra Tutorial- sheets will discuss with students during extra classes.
		CO5	select the design technique to solve any real world problem.	3	3	3	2.5	-0.5	Attained	Discuss more practical examples in class room session
		CO6	design efficient algorithm using various design techniques.	3	3	3	2.5	-0.5	Attained	More practical problem should be given to student implementing
	180303 Operating System	CO1	define the basic concept of operating systems	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO2	explain the working procedure of the operating system	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO3	analyze the various operating system problems and issues.	3	3	3	2	-1	Attained	Extra Tutorial- sheets will discuss with students during extra classes
		CO4	determine the solutions for various operating system problems and issues.	3	2.9	2.93	2	-0.93	Attained	Discuss more practical examples in class room session
		CO5	evaluate the performance of various scheduling and allocation techniques.	3	3	3	2	-1	Attained	Extra Tutorial- sheets will discuss with students during extra classes
		CO6	elaborate the working of various scheduling and allocation techniques.	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
	180304 Computer Networks and protocol	CO1	explain the fundamental concepts of computer network	3	3	3	2.5	-0.5	Attained	Subsequent extra classes should be conducted beyond the regular planned classes.
		CO2	illustrate the basic taxonomy & terminologies of computer network protocols.	2.64	3	2.71	2.5	-0.212	Attained	Discuss more practical examples in class room session
		CO3	develop a concept for understanding advance computer network	2.96	3	2.97	2.5	-0.466	Attained	Discuss more practical examples in class room session
		CO4	build the skill of addressing and routing mechanism	3	3	3	2.5	-0.5	Attained	Extra Tutorial- sheets will discuss with students during extra classes.
		CO5	predict the performance of computer network in collision and delay	1.76	3	2.01	2.5	0.492	[redacted]	Discuss more practical examples in class room session
		CO6	compare the protocol mechanism for implementation of computer networking concept	1.92	3	2.14	2.5	0.364	[redacted]	More practical problem should be given to student implemen
	180305 Database management System	CO1	demonstrate the concepts of different types of database system	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO2	apply relational algebra concepts for design database system	3	3	3	2	-1	Attained	Extra Tutorial- sheets will discuss with students during extra classes
		CO3	make the decision on the use and access database system	3	3	3	2	-1	Attained	Discuss more programming solutions to student for analying programming problems.
		CO4	analyze the evaluation of transaction processing and concurrency control	3	3	3	2	-1	Attained	Extra Tutorial- sheets will discuss with students during extra classes
		CO5	determine the need of the solution	3	3	3	2	-1	Attained	Discuss more practical examples in class room session
		CO6	design a DB model for a given system and real world application	3	3	3	2	-1	Attained	More practical problem should be given to student implemen

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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - XIV

PO Attainment, CO-PO Mapping and Gap Analysis for Batch 2018-2022 (Information Technology)

[ITEM IT - 18]

Madhav Institute of Technology & Science, Gwalior- 474005

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Information Technology

Table 1: Summary of Program Outcomes (2018 Admitted Batch)

PO ATTAINMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Direct PO Attainment	2.66	2.67	2.64	2.69	2.58	2.64	2.64	2.70	2.63	2.62	2.64	2.66	2.63	2.64
Indirect PO Attainment	2.32	2.40	2.33	2.38	2.41	2.49	2.62	2.44	2.48	2.52	2.33	2.53	2.43	2.43
Overall PO Attainment	2.59	2.62	2.58	2.63	2.54	2.61	2.64	2.65	2.60	2.60	2.58	2.63	2.59	2.597

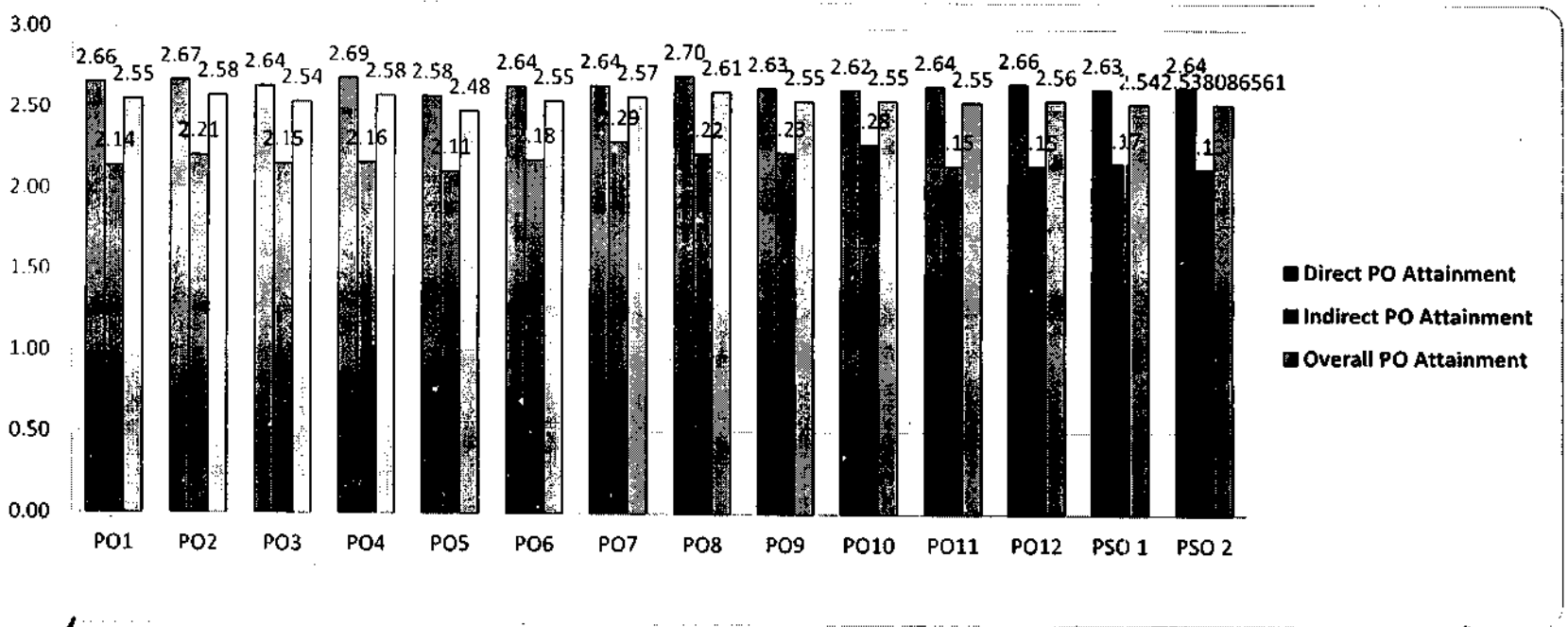

Fig.1: Bar Charts for PO ATTAINMENT (2018 Admitted Batch)

Table 2: Assessment of Direct Program Outcomes (2018 Admitted Batch)

S.No.	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSQ 2
1	100203: Basic Computer Engineering	2.24	2.23	2.31	2.23	2.21	2.36	2.33	2.23	2.23	2.20	2.19	2.18	2.14	2.37
2	100203: Basic Computer Engineering LAB	2.53	2.58	2.54	2.54	2.52	2.59	2.52	2.57	2.54	2.54	2.62	2.56	2.66	2.56
3	160304: OOPs and methodology	1.60	1.68	2.00	1.63	1.56	1.70	1.64	1.81	1.67	1.86	1.76	1.62	1.83	2.00
4	160303: Computer Graphics and Multimedia	1.95	1.93	1.90	1.98	2.01	1.88	1.86	1.97	1.92	2.07	1.90	1.91	1.94	1.88
5	160302: Data Structure LAB	2.89	2.91	2.91	2.81	2.99	2.91	2.88	2.99	2.92	2.73	2.93	2.89	2.91	2.87
6	160303: Computer Graphics LAB	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
7	160304: Object Oriented Programming LAB	1.80	1.87	1.78	1.77	1.82	1.80	1.70	1.80	1.86	1.82	1.78	1.79	1.85	1.77
8	160305: Hardware LAB	2.98	2.98	2.98	3.00	2.98	2.98	2.98	2.98	2.98	3.00	2.97	2.99	2.98	2.98
9	160301: Digital Electronics	1.84	3.00	1.88	2.35	1.94	2.38		2.55	1.88	1.70	2.27	2.44	2.34	1.84
10	160302: Data Structures	2.75	2.73	2.71	2.75	2.56	2.75	2.76	2.86	2.72	2.52	2.74	2.68	2.74	2.60
11	160401: Design and Analysis of Algorithm	2.39	2.45	2.38	2.21	2.40	2.23	2.23	2.62	2.53	1.99	2.60	2.50	2.44	2.40
12	160402: Database management system	2.77	2.62	2.32	2.47	2.53	2.72	2.62	2.53		2.62	2.11	2.57	2.39	2.65
13	160403: Operating system	2.68	2.56	2.56	2.82	2.14	2.66	2.78	2.78	2.56	2.52	2.73	2.67	2.57	2.67
14	160404: Computer System Organization	2.97	3.00	3.00	2.99	2.92	2.99	3.00	2.99	3.00	2.84	3.00	3.00	3.00	2.99
15	100004: Cyber Security	2.97	2.96	2.97	3.00	2.94	2.96	2.95	3.00	2.97	3.00	3.00	2.97	2.97	2.97
16	160501: Discrete Structures	2.76	2.67	2.67	2.68	2.97	2.73	2.68	3.00	2.70	2.98	2.73	2.76	2.76	2.74
17	160503: Theory of Computation LAB	2.48	2.49	2.53	2.60	2.54	2.39	2.16	2.71	2.55	2.62	2.64	2.60	2.54	2.50
18	160502: Software Engineering LAB	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
19	160504: Microprocessor and interfacing LAB	2.97	2.49	3.00	2.59	2.92	2.38	2.84	2.14	2.90	3.00	2.68	2.60	2.59	2.97
20	160503: Theory of Computation	2.67	2.77	2.68	2.91	2.81	2.60	2.55	2.52	2.75	2.81	2.60	2.65	2.65	2.65
21	160502: Software Engineering	2.41	2.50	2.45	2.59	2.36	2.30	2.13	2.38	2.45	2.59	2.53	2.54	2.48	2.40
22	160504: Microprocessor & Interfacing	2.93	2.97	2.96	2.87	3.00	2.93	2.91	3.00	2.97	2.80	2.94	2.92	2.94	2.95
23	160601: Compiler Design	2.61	2.63	2.58	2.91	2.61	2.55	2.54	2.84	2.67	2.47	2.61	2.61	2.58	2.57
24	160602: Computer Networks	2.63	2.50	2.48	2.81	2.14	2.66	2.69	2.76	2.50	2.49	2.63	2.57	2.49	2.61
25	160602: Agile Methodology	2.84	2.74	2.80	2.70	2.59	2.72	2.79	2.88	2.59	2.57	2.77	2.74	2.71	2.65
26	160611: Network and Web security	2.54	2.44	2.43	2.74	1.77	2.48	2.63	2.66	2.42	2.51	2.45	2.49	2.39	2.52

27	160716: Mobile Computing	2.93	2.98	2.92	2.94	2.93	2.98	2.95	2.93	2.94	2.92	2.93	2.94	2.93	2.95
28	900208: Soft Computing	2.83	2.77	2.77	2.97	2.42	2.91	2.91	2.88	2.75	2.67	2.92	2.83	2.76	2.82
29	900209: Network Security	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
30	900220: R Programming	2.98	2.98	2.96	2.97	2.96	2.97	2.98	3.00	2.98	3.00	2.95	2.97	2.98	2.98
31	900222: Computer Networks	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Table: 3 Assessments of Indirect Program Outcomes (2021-22)

	INDIRECT PO ATTAINMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
Survey 1	(Exit Survey)	2.32	2.40	2.33	2.38	2.41	2.49	2.62	2.44	2.48	2.52	2.33	2.53	2.43	2.43
Survey 2	(Alumni Survey)	2.10	2.10	2.06	2.14	2.01	2.08	2.06	2.12	2.14	2.19	2.26	2.23	2.15	2.10
Survey 3	(Employer Survey)	1.84	1.93	1.90	1.74	1.61	1.66	1.87	1.89	1.82	1.90	1.68	1.31	1.66	1.58
	Indirect PO Attainment (average)	2.14	2.20												

Table: 4 Assessments of Overall Program Outcomes (2018 Admitted Batch)

POs	PO Statement	Direct PO Attainment	Indirect PO Attainment	Overall PO Attainment	Target	Gap	Status of PO Attainment	Action Taken Report
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems	2.66	2.14	2.55	2.40	-0.15	Attained	Emphasized the role of fundamental sciences in Information Technology domain by conducting the virtual tours of the Labs related to domain.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2.67	2.21	2.58	2.40	-0.18	Attained	The significance of literature survey was outlined to students.

PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations	**2.64**	**2.15**	**2.54**	**2.40**	**-0.14**	**Attained**	Organized Expert Lectures from leading R & D organizations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions	**2.69**	**2.16**	**2.58**	**2.40**	**-0.18**	**Attained**	Using the Industry Institute labs students were demonstrated the solution for engineering problems. As well the students were assigned the small projects as self-study and the project exhibition was conducted at the end of the semester.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations	**2.58**	**2.11**	**2.48**	**2.40**	**-0.08**	**Attained**	Using Software lab, IOT lab, and IBM lab students were demonstrated the capabilities of software solutions.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice	**2.64**	**2.18**	**2.55**	**2.40**	**-0.15**	**Attained**	Engineers' decision making is very important because the ultimate beneficiary is the general public or society at large. This was emphasized through the course Constitution of India and Professional Ethics. Three weeks' induction program also outlined the contribution of engineers to the society.

PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development	**2.64**	**2.29**	**2.57**	**2.40**	**-0.17**	**Attained**	The e waste management and disposal were outlined through videos. The awareness of the role of IT in ecological sustainability was created through eco club.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	**2.70**	**2.22**	**2.61**	**2.40**	**-0.21**	**Attained**	Ethics will guide the engineers to mould the personality trait of an individual which will play a key role in instilling discipline and facilitating students to become a responsible citizen of the nation. This is also reemphasized through the course Constitution of India and Professional Ethics
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	**2.63**	**2.23**	**2.55**	**2.40**	**-0.15**	**Attained**	As part of the self-study evaluation, students were assigned the small projects ingroups; working in the groups enabled them to understand the intricacies of teamwork and decision-making process
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	**2.62**	**2.28**	**2.55**	**2.40**	**-0.15**	**Attained**	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and	**2.64**	**2.15**	**2.55**	**2.40**	**-0.15**	**Attained**	Students get hands on experience on managing small group tasks and associated finances by participating actively in the Curricular, Co-curricular and technical clubs. Technically too students were assigned the small projects in groups as

	apply these to one's own work, as a member and Leader in a team, to manage projects and in multidisciplinary environments.							part of the self-study evaluation, which teaches the nuances of project management.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	**2.66**	**2.15**	**2.56**	**2.40**	**-0.16**	**Attained**	Establishing a Centre for Soft Skills and Life Long Learning for conduction of various activities.
PSO 1	Students are able to exhibit analytical & logical skills and apply knowledge of Information Technology.	**2.63**	**2.17**	**2.54**	**2.40**	**-0.14**	**Attained**	More focus is required on problem solving methods for solving existing problem of IT industry.
PSO 2	Students are able to identify, formulate and resolve real life/social problems by using current development in the field of information technology.	**2.64**	**2.13**	**2.54**	**2.40**	**-0.14**	**Attained**	Conduction of industrial /professional training/ internship for the students

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - XV

Curricula Feedback from Various Stakeholders for November 2022 - March 2023 Semester (Information Technology/ Internet of Things (IoT)/ Artificial Intelligence and Robotics/ Artificial Intelligence & Data Science/ Artificial Intelligence & Machine Learning)

[ITEM IT - 19]

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute, Affiliated to RGPV, Bhopal)

Department of Information Technology

Analysis Report of Feedback on Course Curriculum Collected from various Stakeholders

Session wise analysis and impact report: Nov. 2022- March 2023(1st Sem.)

Based on the feedback data received from total 716 (Approximate) students and 16 faculty members (First semester- IT, IT-AIR, IT-IoT, AIML, AIDS) for the academic session Nov. to March 2023, following points have been analysed:

- It has been observed that, in first semester 45.52% of students are strongly agreed, 30.74% of students are agreed, 20.19% of students are neutral, 3.55% of students are disagreed and no students are strongly disagreed with the syllabus/ content that they have studied in the first semester.
- Some students have suggested to remove:
  - Remove K-Map from **Digital logic design**.
  - Reduce theoretical part from unit 4 and 5 from **Introduction to AIDS** syllabus.
  - Reduced the weightage of transformer from syllabus of **BEE**.
  - Update content of NestedIF and array from **Computer Programming**.
- Students have suggested to add
  - New Course / Content related to problem solving in programming and CPP real life project development through Devops.
  - Content of ML practical problem, SVM in course of "Introduction in AIDS".

- Content of software designing implementation in course.
- Vector Library and API's in computer programming.

- Students have suggested to add course under Honours, Minor specialization, Departmental electives and Open electives such as:
  - Advance CPP, Computer Application in Business, Quantum computing, Game development, Information Security, Dynamic programming for campus placement, Ethical hacking, Web3, Psychology, electronics for robotics and automation system etc.
- It has been observed that, in first semester 60% of faculty members are strongly agreed, 37.5% of faculty members are agreed, 1.25 are neural, 1.25 are disagree with the curriculum, syllabus/ content that they have taught in the first semester.

COURSE CURRICULUM FEEDBACK (by Students on MOODLE): Sample Size: 37 (Avg.)

Subject Name	Student Feedback (Comments)		Response to student comments / Analysis
160122/Computer Programming	Mention the course / contents which in your opinion is outdated & needs to be removed.	Nested IF, Array	This content is necessary for programming.
	Name course / contents which needs to be updated.	Structure, Pointer, function, string, OOPS concept	Already part of syllabus of Computer Programming.
	Is any new course required to meet current needs?	Some more problem solving, Information to IT, Software designing implementation	There is a SIP running on first year on Problem solving through programming where students can solve many problems related to programming. And Introduction to IT is already a part of current scheme and Software engineering will be a subject in further semester where students will cover software designing implementation part.
	Honours:	OOPS, Computer Programming	Already part of syllabus.
	Minor specialization:	Inheritance, Computer network, OOPS	Inheritance and OOPS already part of programming syllabus and computer networks will study in upcoming semesters as departmental core.
	Departmental electives:	Function, Digital logics	Function concept already available in syllabus of Computer Programming, and Digital logic already in current semester, it is core subject of IT, so need to require this departmental elective.
	Open electives:	Array, Physics	Already studied in syllabus of Computer programming, and Physics covered in syllabus of engineering Physics.
100022/Basic	Departmental electives	Digital logic design	**Will be Discussed**

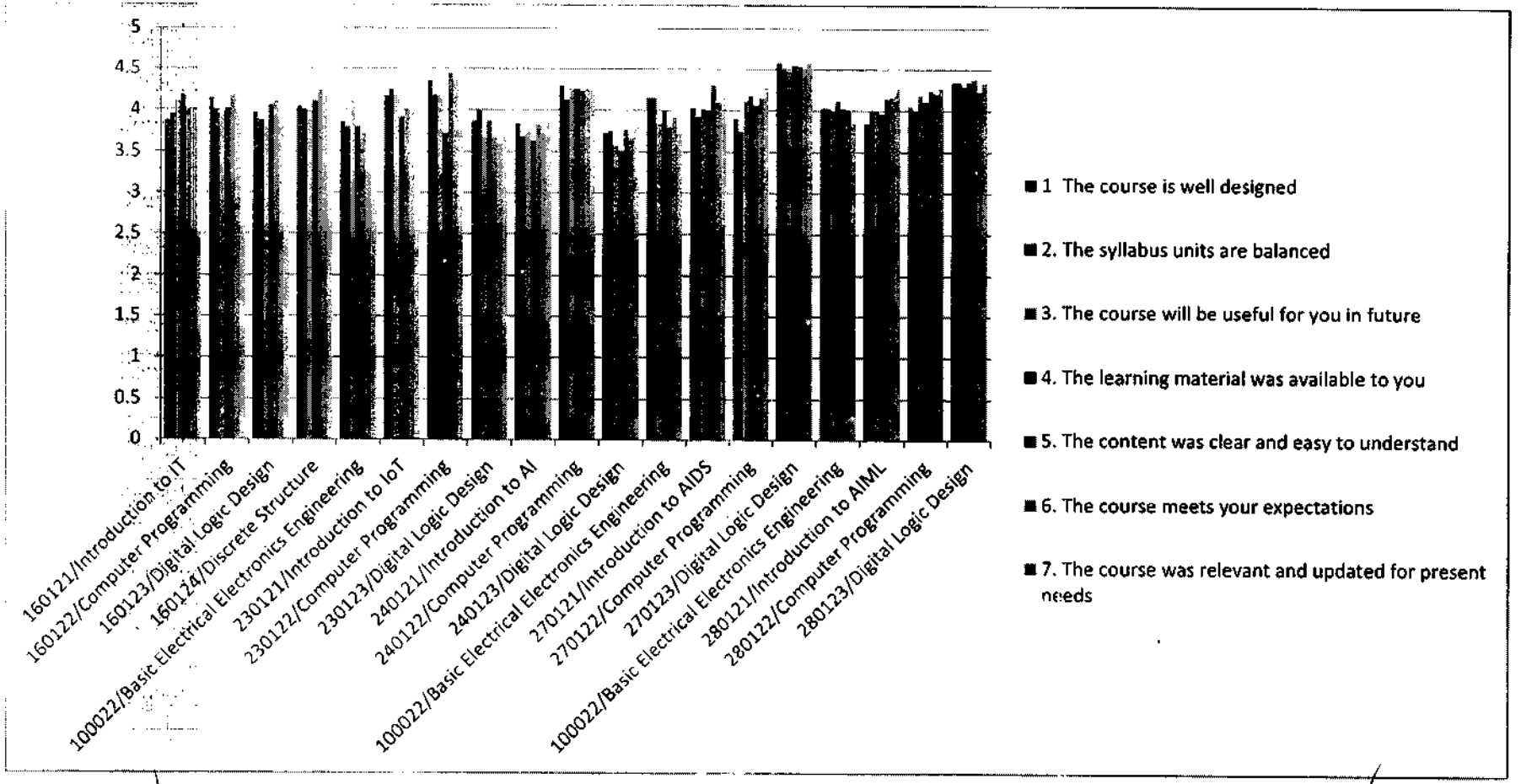
Electrical & Electronics Engineering	Mention the course / contents which in your opinion is outdated & needs to be removed.	I think there is too much weightage on transformers which should be reduced	
230122/Computer Programming	Open electives:	**Computer application in business**	Put these matter in Departmental committee Topics, content and courses will be updated and remove in syllabus, after discussion with subject faculty and HoD.
	Honours:	**Advanced C++**	
240121/Introduction to AI	Honours:	Quantum Computing, there should be more algorithms	Topics/ content and courses will be updated and remove in syllabus, after discussion with Department faculties and Head. Information security: Network And Web Security is already running in 4th semester. Ethical hacking: can be covered in Cyber security & information security
	Minor specialization:	Game Development, There was less robotics in it	
	Departmental electives:	Information security	
	Open electives:	Dynamic Programming for Campus Placements Ethical hacking	
240123/Digital Logic Design	Is any new course required to meet current needs?	Semiconductors	Topics, content and courses will be updated and remove in syllabus, after discussion with Department faculties and HoD. Cyber security, information security and HTML already part of curriculum (students will study in upcoming semesters)
	Honours:	Ethical hacking Information Security	
	Minor specialization:	Block chain hardware security Ethical hacking	
	Departmental electives:	Computer Hardware Block Chain HTML Cyber security	
	Open electives:	Marketing	

270121/Introduction to AIDS	Mention the course / contents which in your opinion is outdated & needs to be removed.	Unit 4 and 5 are consist too much theoretical	ML, SVM, Soft Skill, Electronics and cloud computing already part of curriculum (students will study in upcoming semesters) Topics, content and courses will be updated (like Intro to haskell programming,) and remove in syllabus or curriculum, after discussion with Department faculties.
	Name course / contents which needs to be updated.	way in unit 4 and 5 in which we can understand NLP and other tools „and there must be some minor practical project in unit 3,4,5 in which we can apply ML practically on datasets	
	Is any new course required to meet current needs?	the SVM should be included in this course	
	Honours:	Cloud computing, **Intro to haskell programming,** Blockchain	
	Minor specialization:	Electronics	
	Departmental electives:	Soft skills	
	Open electives:	Bhagvat Gita	
100022/Basic Electrical Electronics Engineering	Minor specialization:	System Design	System design will study in upcoming semesters. (Already part of curriculum)
	Departmental electives:	electronics for robotics and automation system	
280122/Computer Programming	Mention the course / contents which in your opinion is outdated & needs to be removed.	Memory Management through C programming	These topics will study in upcoming semesters.
	Name course / contents which needs to be updated.	Cpp Real life project Deployment through devops	
	Is any new course required to	Vector library and	

	meet current needs?	few renounedapi's should be taught	
	(i) Honours:	Introduction to devops	
	(ii) Minor specialization:	Web3	
	(III) Departmental electives:	Business, Finance	
	(iv) Open electives:	Psychology	
280123/Digital Logic Design	Mention the course / contents which in your opinion is outdated & needs to be removed.	K-Map	Learning of Simplification of boolean expression using k-map is important
	Name course / contents which needs to be updated.	Circuits	Insufficient input
Link	https://drive.google.com/drive/folders/1wmTaDEV1R_KEhH6a7GFUAiGXIQOxBfvJ?usp=share_link		
Action Taken (threshold value 3.5)	After the compilation of data (student feedback for the courses they have studied), we have observed that students are quite satisfied with the courses they have studied. However they have suggested some courses/ up gradation in the existing syllabus. Moreover their suggestions are under consideration.		

Subject Code / Subject Name (no. of students attempted feedback)	1 .The course is well designed	2. The syllabus units are balanced	3. The course will be useful for you in future	4. The learning material was available to you	5. The content was clear and easy to understand	6. The course meets your expectation s	7. The course was relevant and updated for present needs
160121/Introduction to IT (55)	3.89	3.95	4.11	4.18	4.00	4.02	3.95
160122/Computer Programming(58)	4.14	4.00	3.97	4.02	4.17	4.26	4.28
160123/Digital Logic Design (36)	3.97	3.89	3.89	4.06	4.11	3.97	3.78
160124/Discrete Structure (37)	4.05	4.00	4.19	4.11	4.24	4.22	4.27

100022/Basic Electrical Electronics Engineering (70)	3.86	3.81	4.11	3.81	3.72	3.61	3.53
230121/Introduction to IoT (12)	4.17	4.25	4.17	3.92	4.00	4.00	4.00
230122/Computer Programming (11)	4.36	4.18	4.18	3.72	4.45	4.36	4.18
230123/Digital Logic Design (15)	3.87	4.00	3.67	3.87	3.67	3.60	3.67
240121/Introduction to AI (33)	3.84	3.69	3.75	3.63	3.84	3.72	3.84
240122/Computer Programming (34)	4.29	4.12	4.26	4.26	4.24	4.26	4.35
240123/Digital Logic Design (54)	3.74	3.76	3.59	3.52	3.78	3.67	3.80
100022/Basic Electrical Electronics Engineering (26)	4.15	4.15	3.85	4.00	3.81	3.92	3.73
270121/Introduction to AIDS (29)	4.03	3.93	4.03	4.00	4.31	4.10	4.17
270122/Computer Programming (33)	3.91	3.76	4.12	4.18	4.06	4.15	4.27
270123/Digital Logic Design (31)	4.58	4.51	4.48	4.54	4.54	4.51	4.58
100022/Basic Electrical Electronics Engineering (36)	4.03	4.03	4.00	4.11	4.03	4.00	3.86
280121/Introduction to AIML (28)	3.85	4	4	3.96	4.14	4.17	4.28
280122/Computer Programming (37)	4.05	4	4.18	4.11	4.24	4.21	4.27
280123/Digital Logic Design (26)	4.34	4.34	4.30	4.34	4.38	4.23	4.34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160121/Introduction to IT
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160124/Discrete Structure
100022/Basic Electrical Electronics Engineering
230121/Introduction to IoT
230122/Computer Programming
230123/Digital Logic Design
240121/Introduction to AI
240122/Computer Programming
240123/Digital Logic Design
100022/Basic Electrical Electronics Engineering
270121/Introduction to AIDS
270122/Computer Programming
270123/Digital Logic Design
100022/Basic Electrical Electronics Engineering
280121/Introduction to AIML
280122/Computer Programming
280123/Digital Logic Design
1 The course is well designed
2. The syllabus units are balanced
3. The course will be useful for you in future
4. The learning material was available to you
5. The content was clear and easy to understand
6. The course meets your expectations
7. The course was relevant and updated for present needs

Subject Name	Semester	Faculty Name	Strongly Agree in %	Agree in %	Neutral in %	Disagree in %	Strongly disagree in %
160121/Introduction to IT	1	AdityaDubey	36.10	34.55	23.90	5.45	0.00
160122/Computer Programming	1	Dr. DhananjayBisen	43.60	29.80	22.17	3.69	0.74
160123/Digital Logic Design	1	Dr. NidhiSaxena	32.94	37.70	21.43	7.54	0.40
160124/Discrete Structure	1	Dr. VikramRajpoot	39.38	40.15	17.37	2.70	0.39
100022/Basic Electrical Electronics Engineering	1	Dr. Tej Singh	28.78	31.02	25.92	11.84	2.45
230121/Introduction to IoT	1	VikasSejwar	40.00	20.00	40.00	0.00	0.00
230122/Computer Programming	1	Dr. Sanjiv Sharma	40.00	40.00	18.18	1.82	0.00
230123/Digital Logic Design	1	Dr. PawanDubey	17.14	49.52	27.62	3.81	1.90
240121/Introduction to AI	1	AbhilashSonkar	26.84	35.50	27.27	8.23	2.16
240122/Computer Programming	1	AdityaDubey	47.06	37.39	9.66	5.88	0.00
240123/Digital Logic Design	1	Dr. Punit Kumar Johari	25.93	29.10	35.19	7.94	1.85
100022/Basic Electrical Electronics Engineering	1	Dr.PawanDubey	29.67	42.31	22.53	3.85	1.65
270121/Introduction to AIDS	1	Dr. Bhagat Singh Raghuwanshi	44.83	23.15	27.59	4.43	0.00
270122/Computer Programming	1	AdityaDubey	37.66	36.36	20.78	5.19	0.00
270123/Digital Logic Design	1	Dr. Abhishek Dixit	64.06	26.27	9.22	0.46	0.00
100022/Basic Electrical Electronics Engineering	1	Dr.NidhiSaxena	32.94	38.89	24.21	3.97	0.00

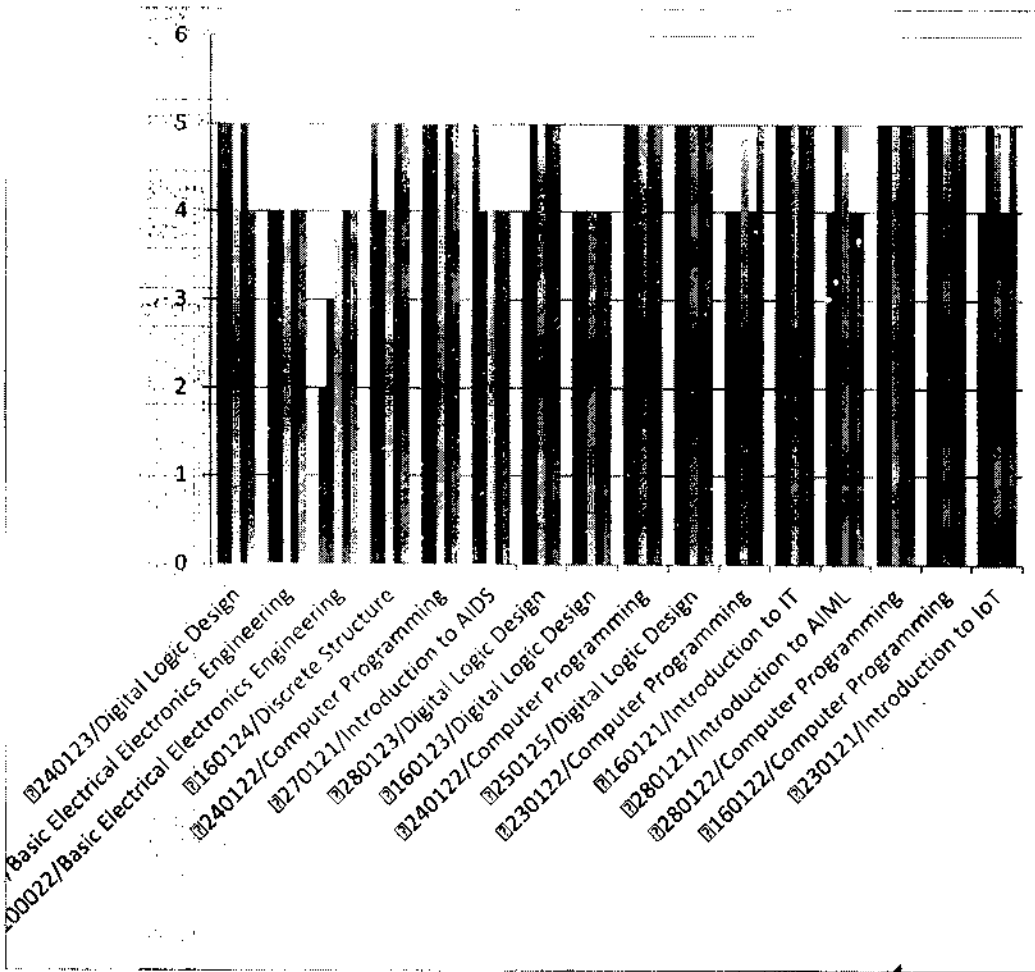
280121/Introduction to AIML	1	Dr. Bhagat Singh Raghuwanshi	36.73	36.22	23.47	3.57	0.00
280122/Computer Programming	1	Mir Shahnawaz Ahmad	39.38	40.15	17.37	2.70	0.39
280123/Digital Logic Design	1	Dr. SaumilMaheshwari	54.94	26.92	16.48	1.64	0
		Average	**45.52**	**30.74**	**20.19**	**3.55**	**0.00**

COURSE CURRICULUM FEEDBACK (by Faculty on MOODLE)

Action taken (threshold value 3.5)
As per given suggestions of faculty members, it is observed that most of the faculty members have satisfied with course content, curriculum/ syllabus and the related other parameters of first semester. The curriculum is capable of inculcating life-long learning abilities in students. Syllabus is updated as per the requirement of current scenario wrt Industry demand and research aspect as well.
Link: https://docs.google.com/spreadsheets/d/1qlJUbGQ4-Wv1vOcrvJ7IrujzPsm_p6sw/edit?usp=share_link&ouid=103555980183400298166&rtpof=true&sd=true

S.N.	Faculty Name	Subject Code/ Subject Name	1. The availability of books & E-learning material in the institute is good. (Please give your opinion)	2. The Courses and content are up to date. Please suggest if you feel any new course(s) need to be introduced to meet current needs & technological changes?	3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends. (Please give suggestions if any)	4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present. If you feel some changes (new content to be added or outdated content to be removed) are needed, please suggest	5. The curriculum is capable of inculcating life-long learning abilities in students. (Any suggestions, please give below)
1	Dr. Nidhi Saxena	100022/Basic Electrical Electronics Engineering	4	4	4	4	4
2	Dr.Tej singh	100022/Basic Electrical Electronics Engineering	2	3	4	4	4
3	Dr. Vikram Rajpoot	160124/Discrete Structure	5	4	4	5	5
4	Dr. Abhishek Dixit	240123/Digital Logic Design	5	5	4	5	4
5	Prof. Aditya Dubey	240122/Computer Programming	5	5	5	5	5
6	Dr. Bhagat Singh Raghuwanshi	270121/Introduction to AIDS	5	4	4	4	4

7	Dr. Saumil Maheshwari	280123/Digital Logic Design	4	5	5	5	5
8	Dr. Nidhi Saxena	160123/Digital Logic Design	4	4	4	4	4
9	Prof. Aditya Dubey	240122/Computer Programming	5	5	5	5	5
10	Dr. Tej Singh	250125/Digital Logic Design	5	5	5	5	5
11	Dr. Sanjiv Sharma	230122/Computer Programming	4	4	5	4	5
12	Prof. Aditya Dubey	160121/Introduction to IT	5	5	5	5	5
13	Dr. Bhagat Singh Raghuwanshi	280121/Introduction to AIML	4	5	5	4	4
14	Prof. Mir Shahnawaz Ahmad	280122/Computer Programming	5	5	5	5	5
15	Dr. Dhananjay Bisen	160122/Computer Programming	5	5	5	5	5
16	Prof. Vikas Sejwar	230121/Introduction to IoT	4	5	5	4	5
	Course Satisfaction Index (CSI) (on a scale of 5) (5: Strongly Agree, 4: Agree, 3: Neutral, 2: Disagree, 1: Strongly disagree)						



- 1. The availability of books & E-learning material in the institute is good. (Please give your opinion)
- 2. The Courses and content are up to date. Please suggest if you feel any new course(s) need to be introduced to meet current needs & technological changes?
- 3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends. (Please give suggestions if any)
- 4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present.[If you feel some changes (new content to be added or outdated content to be removed) are needed, please suggest]
- 5. The curriculum is capable of inculcating life-long learning abilities in students. (Any suggestions, please give below)

	Response in %				
Curriculum Evaluation Point	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. The availability of books & E-learning material in the institute is good. (Please give your opinion)	0	6.25	0	37.5	56.25
2. The Courses and content are up to date. Please suggest if you feel any new course(s) need to be introduced to meet current needs & technological changes?	0		6.25	31.25	62.5
3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends. (Please give suggestions if any)	0	0	0	37.5	62.5
4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present.[If you feel some changes (new content to be added or outdated content to be removed) are needed, please suggest]	0	0	0	43.75	56.25
5. The curriculum is capable of inculcating life-long learning abilities in students. (Any suggestions, please give below)	0	0	0	37.5	62.5
Total	**0**	**1.25**	**1.25**	**37.5**	**60**

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Information Technology

Alumni Feedback

Analysis and Impact Report:

Based on the feedback data received from total 48 Alumni of above mentioned batch following points have been analyzed:

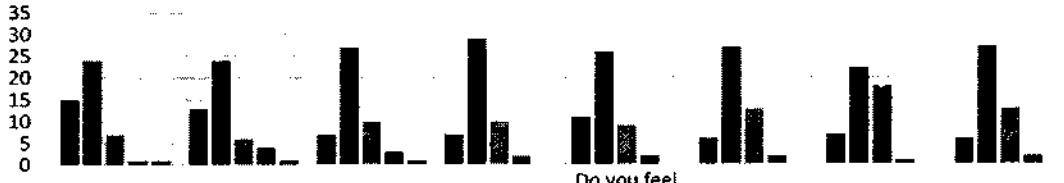
- It has been analyzed that 32.61% of students are strongly agreed, 50% of students are agreed, 15.22% of students are neutral, and 2.17% of students are disagreed with Course content which is interesting and as per Industry needs.
- It is found that 28.26 % of students are strongly agreed, 50% of students are agreed, 13.04% of students are neutral, and 8.69% of students are disagreed to apply, analyze, design and create products and solutions for real life engineering problems.

S. No.	Comments	Action Taken	Result
1	Need to more focus on programming using data structure, or split data structure in two parts so it will be beneficial for students to focus more and more.	To inculcate the habit of coding, mini skill project has already incorporated as a part of scheme.	Implemented
2	focus on development section, which is very useful for grab a job in service based companies	Mini skill project and proficiency in subjects enhance the students' power of thinking and coding.	Implemented
3	Try to add course regarding remove nervousness during interviews	Self-study & seminar gives a platform to the student where he can improve himself write communication.	Implemented
4	Small Projects based on domain should be given in every semester, so that students gain knowledge and develop interest	To inculcate the habit of coding, mini skill project has already incorporated as a part of scheme.	Implemented
5	Last 3 semester's subjects were totally from noir IT background. Try to teach latest technology instead, so that it will	According to the recent scenario, and request of so many students to teach at least	Proposed for discussion

	be helpful for placements	2-3 subjects from other discipline so that they can be more versatile.	
6	More practical Labs than Theory classes	Try to add practicals where not included, and add more practicals where already included for practice.	Discussed
7	Constant updation of curriculum to be industry ready	Suggestions required from industry. Workshops will be conducted with them and will take meetings from alumni.	Implemented
8	focus more on AI and machine learning	This course has already added in higher semesters.	Implemented
9	Internship and coding please	As a part of curriculum, department offers internships to lower semester students and allow higher semester students to go for internships rather than project. Department placement cell also suggest them good company's for internships.	Implemented
10	Data science problem solving	This course has already added in higher semesters.	Implemented
11	Basic need of understanding of current technology management	Mini skill project and proficiency in subjects enhance the students' power of thinking and coding.	Implemented
12	More technology and companies must be invited for placements	T&P cell and department is trying to contact with many companies continuously.	In progress
13	Include more practical lectures than theoretical ones	Try to add practicals where not included, and add more practicals where already included for practice.	Discussed
14	It should include international courses too like Coursera and edx	Students are free for attend any international courses	Discussed

PARAMETERS	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)
Course content is interesting and as per Industry needs	15	24	7	1	1
Are you able To apply, analyze, design and create products and solutions for real life Engineering problems	13	24	6	4	1
Do you feel that you are capable of learning new things in the constantly changing technological world?	7	27	10	3	1
Do you find yourself capable of making a good career	7	29	10	2	0
Do you feel that you are able to manage projects in an ethical manner and work efficiently as a member/leader of multidisciplinary teams.	11	26	9	2	0
Courses meet contemporary requirements	6	27	13	2	0
Reading material regarding curriculum is easily available	7	22	18	1	0
Syllabus enhances employability	6	27	13	2	0
Link of the Alumni feedback	https://docs.google.com/spreadsheets/d/1hj_25OhnOoq8xWH9qY6tfzFoGqNZ0btTWTVXMbH4by4/edit?usp=sharing				

Alumni Feedback



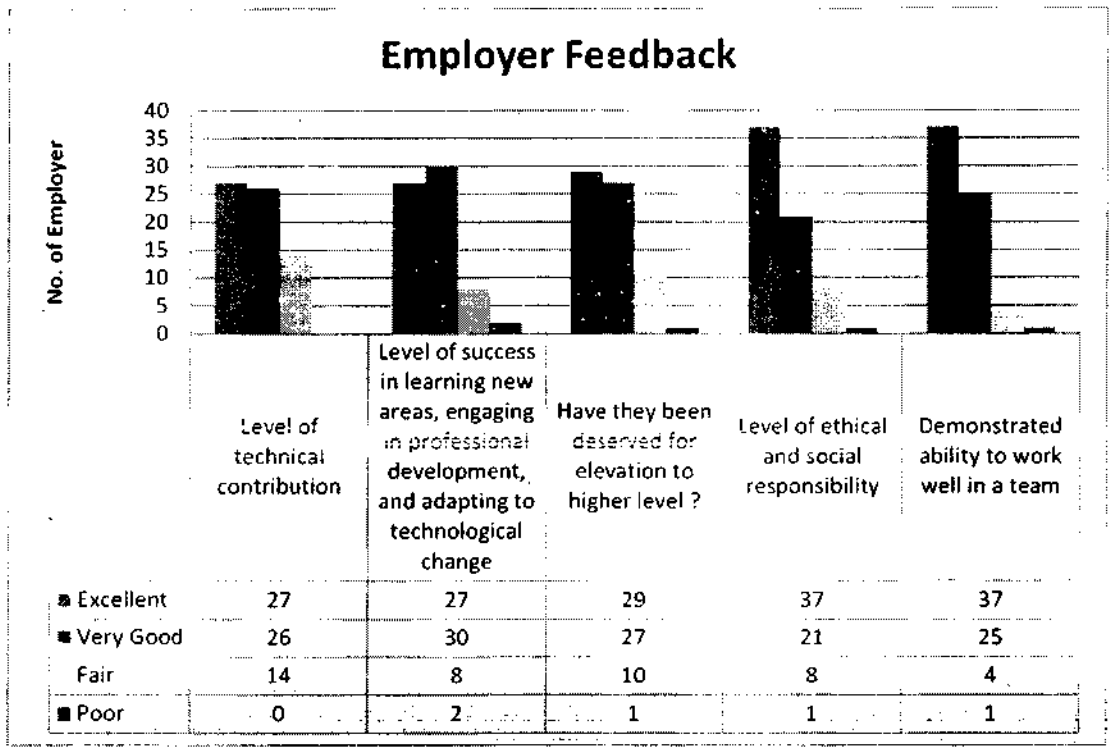
	Course content is interesting and as per Industry needs	Are you able To apply, analyze, design and create products and solutions for real life Engineering problems	Do you feel that you are capable of learning new things in the constantly changing technological world?	Do you find yourself capable of making a good career	Do you feel that you are able to manage projects in an ethical manner and work efficiently as a member/le...	Courses meet contemporary requirements	Reading material regarding curriculum is easily available	Syllabus enhances employability
Strongly Agree (5)	15	13	7	7	11	6	7	6
Agree (4)	24	24	27	29	26	27	22	27
Neutral (3)	7	6	10	10	9	13	18	13
Disagree (2)	1	4	3	2	2	2	1	2
Strongly disagree (1)	1	1	1	0	0	0	0	0

Strongly Agree (5) Agree (4) Neutral (3) Disagree (2) Strongly disagree (1)

EMPLOYER SATISFACTION SURVEY

Sample Size: 67

Parameter (MITS Student working under you or in your Organization)	Excellent	Very Good	Fair	Poor	Employer Satisfaction Index
Level of technical contribution	27	26	14	0	4.19
Level of success in learning new areas, engaging in professional development, and adapting to technological change	27	30	8	2	4.16
Have they been deserved for elevation to higher level?	29	27	10	1	4.22
Level of ethical and social responsibility	37	21	8	1	4.37
Demonstrated ability to work well in a team	37	25	4	1	4.43
Employer Satisfaction Index (ESI) (on a scale of 5) (5: Excellent, 4: Very Good, 3: Good, 2: Fair, 1: Poor)					



Link of Employer Feedback

https://docs.google.com/spreadsheets/d/10Ij8MtXBQSdv8H2bmHfxVIOvQM3qTL3q/edit?usp=sharing&ouid=109055627337813693303&rtpof=true&sd=true

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DEPARTMENT OF INFORMATION TECHNOLOGY

ANNEXURE - XVI

Course Outcomes (COs) feedback Analysis and Impact Report for July - December 2022 Semester (Information Technology/ Internet of Things (IoT)/ Artificial Intelligence and Robotics/ Artificial Intelligence & Data Science/ Artificial Intelligence & Machine Learning)

[ITEM IT - 20]

Madhav Institute of Technology and Science, Gwalior

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Information Technology

Indirect CO Attainment of B. Tech. [Information Technology]

Session: Jul- Dec 2022

Semester	Subject Name/ Code	COs	Indirect Attainment	Semester	Subject Name/ Code	COs	Indirect Attainment	Semester	Subject Name/ Code	COs	Indirect Attainment
Semester III	Computer System Organization (160311)	CO1	80.0	Semester V	160511: Discrete Structure	CO1	93.00	Semester VII	160705: Mobile Computing	CO1	76
		CO2	81.3			CO2	93.00			CO2	66
		CO3	79.3			CO3	87.00			CO3	72
		CO4	78.7			CO4	87.00			CO4	65
		CO5	78.7			CO5	93.00			CO5	65
		CO6	76.7			CO6	87.00			CO6	66
	160312 (DAA)	CO1	81.1		160512: Data Science Using Python	CO1	71.00		160706: Soft Computing	CO1	66.7
		CO2	78.4			CO2	87.00			CO2	68.1
		CO3	76.6			CO3	68.00			CO3	69.6
		CO4	79.3			CO4	68.00			CO4	66.7
		CO5	82.0			CO5	69.00			CO5	66.7
		CO6	76.6			CO6	68.00			CO6	73.9
	160313: DBMS	CO1	86.5		160513: TOC	CO1	85.5				
		CO2	85.6			CO2	87.0				
		CO3	85.6			CO3	82.6				

		CO4	82.0			CO4	82.6				
		CO5	83.8			CO5	81.2				
		CO6	82.0			CO6	79.7				
	160314: OS	CO1	75.36		160514: MP&I	CO1	79				
		CO2	73.91			CO2	81				
		CO3	81.16			CO3	76				
		CO4	78.26			CO4	79				
		CO5	75.36			CO5	77				
		CO6	72.46			CO6	81				
					160515: Soft Computing Technique	CO1	76				
						CO2	66				
						CO3	72				
						CO4	65				
						CO5	65				
						CO6	66				

As per the received response from the students in the form of Cos Feedback, following key points are analysed:

1. Most of the subject COs are achieved with high level of attainment (80%).
2. COs of Soft Computing Techniques and Mobile Computing can be revised.
3. More focused on High order thinking problems.
4. Participation of students in Cos feedback can be improved.
5. Cos can be improved as per the need of industry need.
6. To further improved the feedback, different mode of COs feedback can be considered.

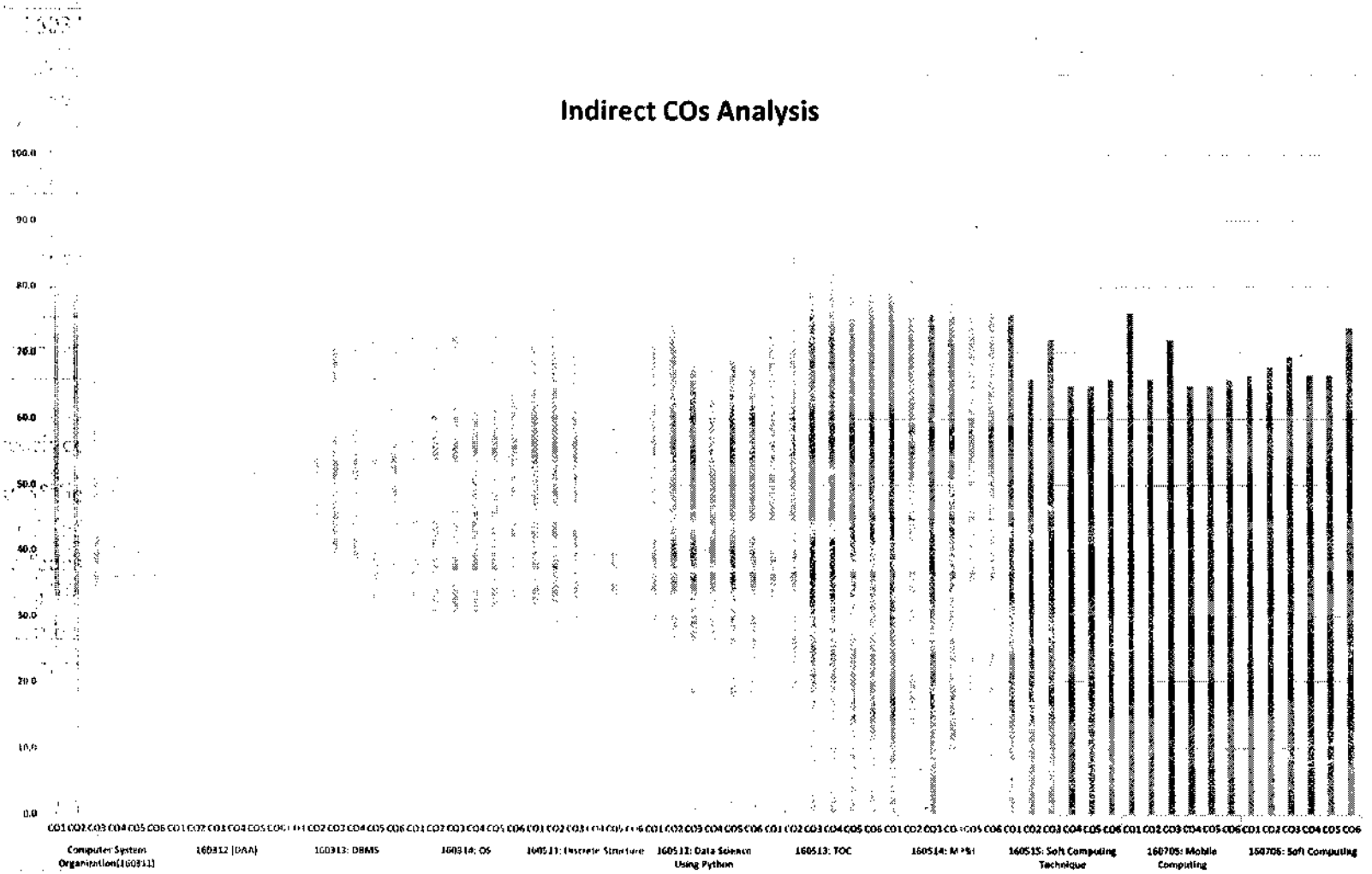

Figure 1 Indirect COs Analysis

Madhav Institute of Technology and Science, Gwalior
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Department of Information Technology

Indirect CO Fedback attainment analysis of B. Tech. IoT

Session: july-jan 2022

	Course Name		Indirect Attainment %
Semester III	(230301) Design, analysis and algorithms	CO1	75
		CO2	69
		CO3	72
		CO4	71
		CO5	71
		CO6	70
	operating system (230302)	CO1	73
		CO2	73
		CO3	73
		CO4	61
		CO5	61
		CO6	61
	Computer networks and Protocols (230303)	CO1	76
		CO2	75
		CO3	76
		CO4	73
		CO5	75
		CO6	75
	Database management Systems(230304)	CO1	86
		CO2	78
		CO3	78
		CO4	78
		CO5	84
		CO6	77
	Discrete structure (230501)	CO1	89
		CO2	86
		CO3	86
		CO4	87
		CO5	86
		CO6	84
	Data science in IoT (230502)	CO1	86
		CO2	87
		CO3	83
		CO4	83
		CO5	81
		CO6	80
ar V		CO1	100
		CO2	75

Semest	CO3	74
	CO4	81
	CO5	78
	CO6	75
	CO1	78
	CO2	77
	CO3	74
	CO4	75
	CO5	76
	CO6	71
	CO1	86
	CO2	87
	CO3	83
	CO4	84
	CO5	83
	CO6	81

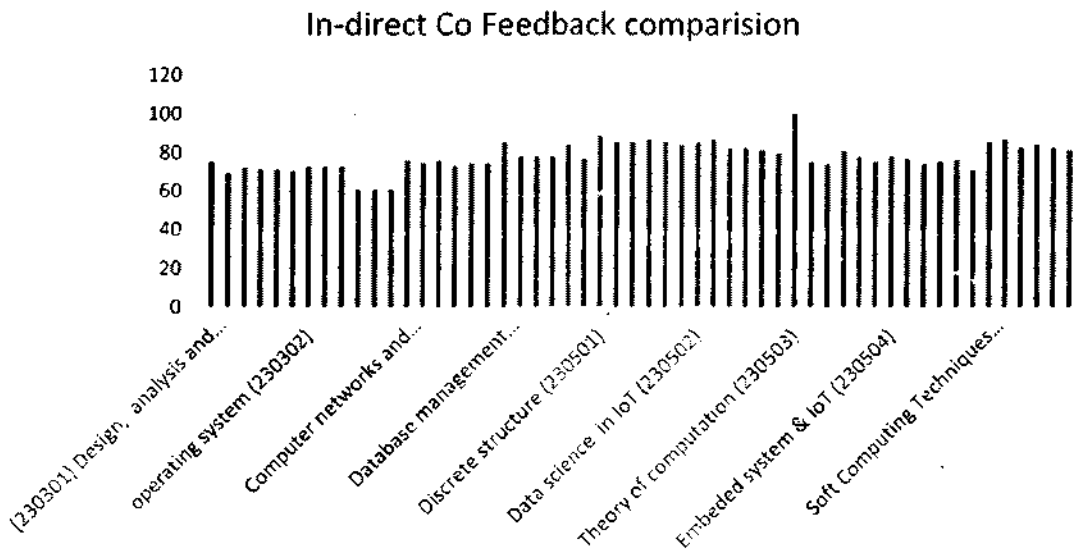

Fig. Comparative indirect CO feedback IoT

Analysis:

1. All cos are attained with 70 % in III and V Sem courses.
2. Therefore there is a need of indirect attainments of third semester.
3. More higher order thinking question can be given in both semester subjects

Madhav Institute of Technology and Science, Gwalior
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CO Feedback Analisis of B. Tech. AIR
Session:July- Dec'2022

	Course Name		Indirect Attainment %
Semester III	(240301) Design, analysis and algorithms	CO1	75
		CO2	69
		CO3	72
		CO4	71
		CO5	71
		CO6	70
	operating system (240302)	CO1	73
		CO2	73
		CO3	73
		CO4	61
		CO5	61
		CO6	61
	Computer Networks & Protocols(240303)	CO1	76
		CO2	75
		CO3	76
		CO4	73
		CO5	75
		CO6	75
	Database management Systems(240304)	CO1	86
		CO2	78
		CO3	78
		CO4	78
		CO5	84
		CO6	77
Semester V	Discrete structure (240501)	CO1	89
		CO2	86
		CO3	86
		CO4	87
		CO5	86
		CO6	84
	Datasciences using Python(240502)	CO1	86
		CO2	87
		CO3	83
		CO4	83
		CO5	81
		CO6	80
	Theory of computation (240503)	CO1	76
		CO2	75
		CO3	76
		CO4	73
		CO5	75
		CO6	75
		CO1	81

Robotics and system control (240504	CO2	80
	CO3	80
	CO4	83
	CO5	80
	CO6	80
Soft Computing Techniques (250505)	CO1	86
	CO2	87
	CO3	83
	CO4	84
	CO5	83
	CO6	81

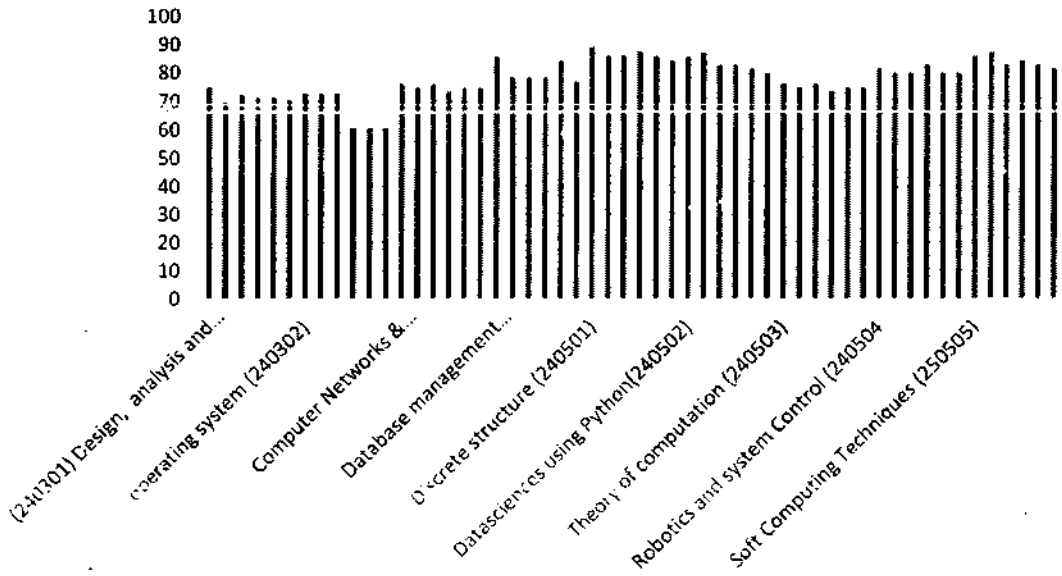

Fig. Comparative indirect CO feedback

Analysis:

1. All cos are attained with 70 % in III Semester courses whereas 80 % in V Semester courses

2. Therefore there is a need of indirect attainments of third semester.
3. more higher order thinking question can be given in both semester subjects

Madhav Institute of Technology and Science, Gwalior

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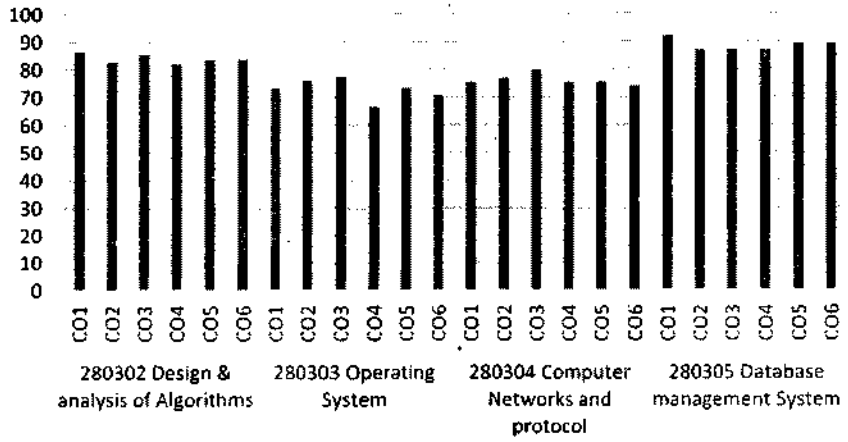
Department of Information Technology

Indirect CO Attainment of B. Tech. [Artificial Intelligence and Machine Learning]

Session: Jul- Dec 2022

Semester	Subject Name/ Code	COs	Indirect Attainment
Semester III	280302 Design & analysis of Algorithms	CO1	86.48648649
		CO2	82.88288288
		CO3	85.58558559
		CO4	81.98198198
		CO5	83.78378378
		CO6	83.78378378
	280303 Operating System	CO1	73.33333333
		CO2	76
		CO3	77.33333333
		CO4	66.66666667
		CO5	73.33333333
		CO6	70.66666667
	280304 Computer Networks and protocol	CO1	75.36231884
		CO2	76.8115942
		CO3	79.71014493
		CO4	75.36231884
		CO5	75.36231884
		CO6	73.91304348
	280305 Database management System	CO1	92
		CO2	87
		CO3	87
		CO4	87
		CO5	89
		CO6	89

Indirect COs Analysis



As per the received response from the students in CO Feedback, following key points are analysed

1. Majority of subjects have attainment of more than 75%
2. CO 4 attainment of Operating system is less than 70% , hence necessary actions are to be taken
3. CO1 attainment of DBMS is 92% which is very significant
4. Participation of students in CO feedback needs to be improved
5. CO's can be enhanced as per industry standards/requirements

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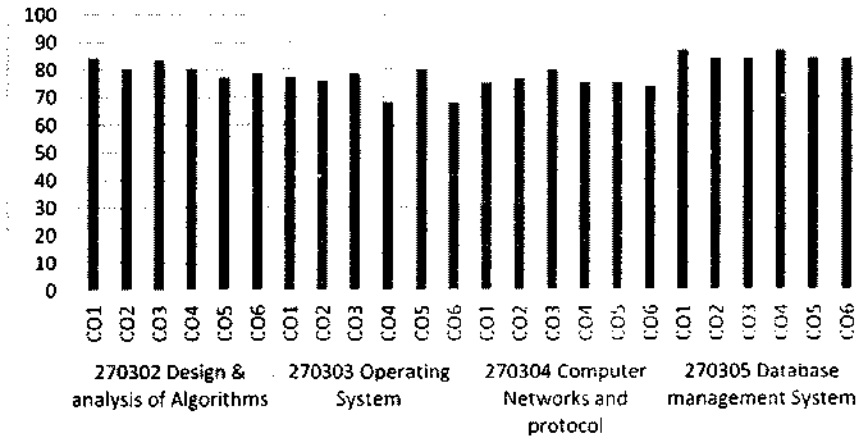
Department of Information Technology

Indirect CO Attainment of B. Tech. [Artificial Intelligence and Data science]

Session: Jul- Dec 2022

Semester	Subject Name/ Code	COs	Indirect Attainment
Semester III	270302 Design & analysis of Algorithms	CO1	84.09090909
		CO2	80.3030303
		CO3	83.33333333
		CO4	80.3030303
		CO5	77.27272727
		CO6	78.78787879
	270303 Operating System	CO1	77.33333333
		CO2	76
		CO3	78.66666667
		CO4	68
		CO5	80
		CO6	68
	270304 Computer Networks and protocol	CO1	75.36231884
		CO2	76.8115942
		CO3	79.71014493
		CO4	75.36231884
		CO5	75.36231884
		CO6	73.91304348
	270305 Database management System	CO1	87
		CO2	84
		CO3	84
		CO4	87
		CO5	84
		CO6	84

Indirect CO Analysis



As per the received response from the students in CO Feedback, following key points are analysed

1. Majority of subjects have attainment of more than 75%
2. CO 4 and CO6 attainment of Operating system is less than 70% , hence necessary actions are to be taken
3. Participation of students in CO feedback needs to be improved
4. CO's can be enhanced as per industry standards/requirements