SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

03.03.2025
Puducherry

From

Dr.R.Raju
Professor and Head
Chairman - BoS/IT
Department of Information Technology
Sri Manakula Vinayagar Engineering College
Puducherry - 605107

To

The Director cum Principal
Chairman/Academic Council
Sri Manakula Vinayagar Engineering College
Puducherry - 605107

Respected Sir,

Sub: Requisition for the approval to conduct Ninth Meeting of Board of Studies on 14.3.2025 - Reg.

I would like to bring to your kind notice that we have planned to conduct the Ninth Board of Studies meeting in the Department of Information Technology on 14.3.2025, Friday from 2.00 PM to 4.30 PM as per your direction. This meeting focuses on finalizing and approving the curriculum R-2023, syllabi of B.Tech./IT, Seventh Semester and Honors Degree Syllabi for the upcoming semester. We have enclosed the Agenda of meeting in Annexure - I. The venue of the meeting is at Seminar Hall (V Floor). Sir, I kindly request you to do the needful in the above regard.

Thanking You

yours faithfully

(Dr.R.Raju, HOD/IT)

Encl:
Annexure I : BOS Agenda
Annexure II: BOS Members list

Dean Academics
(Dr.S.Anbumalar)

Director cum Principal
(Dr.V.S.K.Venkatachalapathy)

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

Annexure I

9th Board of Studies Meeting
Department of Information Technology

Venue
Application Programming Laboratory
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry – 605 107

Date & Time
14.03.2025
02.00 pm

AGENDA OF THE MEETING

Item No:BoS/UG/IT/9.1
To welcome the members and apprise about the college
Item No:BoS/UG/IT/9.2
To Confirm the minutes of the Eighth BoS meeting held on 04.9.2024
Item No:BoS/UG/IT/9.3
To discuss the Syllabi of VII semester, under Autonomous Regulations R-2023 for the B. Tech - Information Technology students admitted from the Academic Year 2023-24
Item No:BoS/UG/IT/9.4
To discuss the B.Tech. Degree, Professional and Open Elective Courses selected for the VII semester under Regulation 2023 along with assessment methodologies
Item No:BoS/UG/IT/9.5
To discuss the syllabus of the Honors and Minors Degree
Item No:BoS/UG/IT/9.6
To discuss the Assessment Methodology for the Honors and Minors Degree
Item No:BoS/UG/IT/9.7
Details of Students Registered for Honors and Minors Degree
Item No:BoS/UG/IT/9.8
To appraise about the methods to be adopted for Internship / Inplant Training
Item No:BoS/UG/IT/9.9
To Apprise about the Department Research Activities
Item No:BoS/UG/IT/9.10
To Apprise about the End Semester Examination Results
Item No:BoS/UG/IT/9.11
To discuss about the remarkable Achievements of Faculty and Students
Item No:BoS/UG/IT/9.12
Any other items to be discussed with the permission of the Chair

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

DEPARTMENT OF INFORMATION TECHNOLOGY

Annexure II

Board of Studies - Members List

S.NO.	Name of the Member	Designation
1.Head of the Department Concern (Chairperson)		
1	**Dr. R. Raju** Professor & Head	Chairperson
2.All faculty members of the Department		
2	**Dr. S. Balaji** Professor	Member Secretary
3	**Dr. R. Saravanan** Professor	Member
4	**Dr. N. Thilagavathi** Professor	Member
5	**Dr. B. Vijayakumar** Associate Professor	Member
6	**Dr. Puspita Dash** Associate Professor	Member
7	**Dr. R. Anandkumar** Assistant Professor	Member
8	**Dr. B. Ananth** Assistant Professor	Member
9	**Mr. R. Suresh** Associate Professor	Member
10	**Mrs. V. Padmapriya** Associate Professor	Member
11	**Mrs. N. Kalaiselvi** Assistant Professor	Member
12	**Mrs. M. Lakshmiprabha** Assistant Professor	Member
13	**Mrs. E. Valarmathi** Assistant Professor	Member
14	**Mr. P. Praveenkumar** Assistant Professor	Member
15	**Mr. G. Prabu** Assistant Professor	Member
16	**Mrs. C. Vanaja** Assistant Professor	Member
17	**Ms. L. Durgadevi** Assistant Professor	Member
18	**Mr. T. Periasamy** Assistant Professor	Member
19	**Ms. K. Poornambigai** Assistant Professor	Member

20	**Mr. T. Maheswaran** Assistant Professor	Member
21	**Mr. R. Vijayaprabhu** Assistant Professor	Member
22	**Mr. D. Prabhu** Assistant Professor	Member
23	**Ms. M. Madhumitha** Assistant Professor	Member
24	**Ms. A. Sowbarnika** Assistant Professor	Member
25	**Mr. A. Ranjeeth** Assistant Professor	Member
26	**Ms. V. Keerthana** Assistant Professor	Member
27	**Ms. M. Nandhini** Assistant Professor	Member
28	**Dr.N.S.N. Cailassame** Professor & Dean Placement Department of Management Studies	Member
29	**Mr. M. Devanathan** Assistant Professor Department of Mathematics , SMVEC	Member
30	**Dr. P. Jaichitra** Professor and Head Department of English, SMVEC	Member
31	**Dr. K. Karthikeyan** Associate Professor Department of Chemistry, SMVEC	Member
32	**Dr. T. Jayavarthanan** Professor and Head Department of Physics, SMVEC	Member
3. Two subject experts from outside the Parent University are to be nominated by the Academic Council		
33	**Dr.R.Manoharan, M. Tech., Ph.D** Professor, Department of CSE Puducherry Technological University, Puducherry rmanoharan@pec.edu , 9443468480 Specialization: High Speed Networks, Internet Technology, Software Engineering	Subject Expert
34	**Dr.N.Pughazendi**, Professor and Head, School of Science and Computer Studies, CMR University, Bangalore, pughazendi.n@cmr.edu.in, 9962969429 Specialization: Software Engineering, Cloud Computing	Subject Expert
4. One expert to be nominated by the Vice-Chancellor from a panel of six recommended by the Autonomous college Principal as a University Nominee		
35	**Dr. S. Kanmani** Professor, Department of Information Technology Puducherry Technological University, Puducherry kanmani@ptuniv.edu.in , 9443206299 Specialization: Machine Learning Algorithms, Optimization Techniques	Subject Expert
5. One representative from industry/corporate sector/allied areas to be nominated by the Principal		
36	**Mr. Ashin Antony**, CTO, IGNITHO Technologies, Chennai-600018 ashin.antony@ignitho.com, 9444150791	Member

6. One member of the College Alumni to be nominated by the principal		
37	**Dr. P. Victer Paul,** Senior Assistant Professor, Department of Computer Science and Engineering, Indian Institute of Information Technology, Kottayam victerpaul@iiitkottayam.ac.in , 9944913170 Specialization: Bio-Inspired Optimization, Data Analytics	Member
7.Experts from outside the Autonomous College, whenever special courses of studies are to be formulated, to be nominated by the Principal		
-	-	-

Dean Academics
(Dr.S.Anbumalar)

Director cum Principal
(Dr.V.S.K.Venkatachalapathy)

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)
Puducherry - 605107

Department of Information Technology

BOARD OF STUDIES - NINTH MEETING

MINUTES

Date and Time
14.03.2025 at 02.00 PM

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

Department of Information Technology

Minutes of Board of Studies

The Board of Studies Ninth meeting of Department of Information Technology was held on 14th March 2025 from 2:00 P.M to 5:00 P.M in the Application Programming Laboratory, Department of Information Technology with the Head of the Department as the Chair.

The following members were present for the BoS meeting.

Sl.No	Name of the Member with Designation and official Address	Members as Per University norms
1	**Dr. R. Raju, M.Tech, Ph.D** Professor & Head Department of IT, SMVEC	Chairperson
2	**Dr. S. Kanmani** Professor, Department of Information Technology Puducherry Technological University, Puducherry	Subject Expert (University Nominee)
3	**Dr.R.Manoharan, M. Tech., Ph.D** Professor, Department of CSE Puducherry Technological University, Puducherry	Subject Expert (Academic Council Nominee)
4	**Dr.N.Pughazendi,** Professor and Head, School of Science and Computer Studies CMR University, Chennai	Subject Expert (Academic Council Nominee)
5	**Mr.Ashin Antony,** CTO,IGNITHO Technologies, Chennai-600018	Representative from Industry
6	**Dr. P. Victer Paul,** Senior Assistant Professor, Department of Computer Science and Engineering, IIIT, Kottayam	Post Graduate Alumnus (nominated by Principal)
7	**Dr. S. Balaji** Associate Professor/IT	Member Secretary
8	**Dr. R. Saravanan** Professor	Member
9	**Dr. N. Thilagavathi** Associate Professor	Member
10	**Dr. B. Vijayakumar** Associate Professor	Member
11	**Dr. Puspita Dash** Associate Professor	Member
12	**Dr. R. Anandkumar** Assistant Professor	Member
13	**Dr.B.Ananth** Assistant Professor	Member

14	**Mr. R. Suresh** Associate Professor	Member
15	**Mrs. V. Padmapriya** Associate Professor	Member
16	**Mrs. N. Kalaiselvi** Assistant Professor	Member
17	**Mrs. M. Lakshmiprabha** Assistant Professor	Member
18	**Mrs. E. Valarmathi** Assistant Professor	Member
19	**Mr. P. Praveenkumar** Assistant Professor	Member
20	**Mr. G. Prabu** Assistant Professor	Member
21	**Mrs. C. Vanaja** Assistant Professor	Member
22	**Ms. L. Durgadevi** Assistant Professor	Member
23	**Mr. T. Periasamy** Assistant Professor	Member
24	**Ms. K. Poornambigai** Assistant Professor	Member
25	**Mr. T. Maheswaran** Assistant Professor	Member
26	**Mr. R. Vijayaprabhu** Assistant Professor	Member
27	**Mr. D. Prabhu** Assistant Professor	Member
28	**Ms. M. Madhumitha** Assistant Professor	Member
29	**Ms. A. Sowbarnika** Assistant Professor	Member
30	**Mr. A. Ranjeeth** Assistant Professor	Member
31	**Ms. V. Keerthana** Assistant Professor	Member
32	**Ms. M. Nandhini** Assistant Professor	Member
33	**Dr.N.S.N. Cailassame** Professor & Dean Placement Department of Management Studies	Member
34	**Dr. K. Karthikeyan** Associate Professor Department. of Chemistry	Member
35	**Prof. M. Devanathan** Assistant Professor Department of Mathematics	Member
36	**Dr. P. Jaichitra** Professor and Head Department of English	Member
37	**Dr.T.Jayavarthanan** Professor Department. of Physics	Member

Agenda of the Meeting	
Item:2025.9.1	To welcome the members and apprise about the college
Item:2025.9.2	To Confirm the minutes of the Eighth BoS meeting held on 04.9.2024
Item:2025.9.3	To discuss the Syllabi of VII semester, under Autonomous Regulations R-2023 for the B. Tech - Information Technology students admitted from the Academic Year 2023-24
Item:2025.9.4	To discuss the B.Tech. Degree, Professional and Open Elective Courses selected for the VII semester under Regulation 2023 along with assessment methodologies
Item:2025.9.5	To discuss the syllabus of the Honors and Minors Degree
Item:2025.9.6	To discuss the Assessment Methodology for the Honors and Minors Degree
Item:2025.9.7	Details of Students Registered for Honors and Minors Degree
Item:2025.9.8	To appraise about the methods to be adopted for Internship / Inplant Training
Item:2025.9.9	To Apprise about the Department Research Activities
Item:2025.9.10	To Apprise about the End Semester Examination Results
Item:2025.9.11	To discuss about the remarkable Achievements of Faculty and Students
Item:2025.9.12	Any other items to be discussed with the permission of the Chair

Minutes of the Meeting
Dr. R. Raju, Chairperson, BoS / B.Tech. Information Technology officially announced the opening of the meeting and welcomed the members. He also thanked them for accepting the invitation and giving us their valuable time. The meeting thereafter deliberated on agenda items that had been approved by the Chairperson.

Item:2025.9.1	**To welcome the members and apprise about the college**
	The Chairperson Dr.R.Raju welcomed the members of Board of Studies and apprised about the successful functioning of the college
Item:2025.9.2	**To Confirm the minutes of the Eighth BoS meeting held on 04.9.2024**

As per the suggestions given during 8th BoS meeting the following changes have been carried out in the curriculum and syllabus.

Details of Changes carried in the Courses

S.No.	Existing Course Name	Course Existed in Semester	Suggestion Provided	Changes Carried
1.	Artificial Intelligence	III	To reframe the syllabus , Since Machine Learning contents were included in Unit III	Syllabus reframed by removing Machine Learning Contents
2.	Information Visualization	III	To Ellaborate the contents	Syllabus reframed with elaborated contents
3.	Quantum Computing	III	To add up contents in Unit II	Qubit Gates and Quantum Error Correction has been added
4.	Parallel and Distributed Computing	III	Elective Course can be included	Included instead of Business Intelligence and Applications

Professional Elective List

Professional Elective - I (Offered in Semester IV)		
Sl. No.	**Existing Course Titles**	**After 8th BoS – Approved Course Titles**
1	Object Oriented Analysis and Design	Object Oriented Analysis and Design
2	Web Application Development	Web Application Development
3	Information Coding Techniques	Information Coding Techniques
4	Agile Methodologies	Agile Methodologies
5	Mobile Adhoc Network	Data Warehousing and Data Mining

Professional Elective - II (Offered in Semester V)		
Sl. No.	**Existing Course Titles**	**After 8th BoS – Approved Course Titles**
1	Parallel and Distributed Computing	Theory of Compiler Design
2	Data Warehousing and Data Mining	Information Visualization
3	Business Intelligence and Applications	Parallel and Distributed Computing
4	Software Testing	Software Testing
5	Wireless and Mobile Communication	Automation Techniques and Tools

Professional Elective - III (Offered in Semester VI)		
Sl. No.	**Existing Course Titles**	**After 8th BoS – Approved Course Titles**
1	Distributed Databases	Quantum Computing
2	Bio-Inspired Computing	Full Stack Development
3	Software Defined Networks	Software Defined Networks
4	Natural Language Processing	Natural Language Processing
5	Edge and Fog Computing	Edge and Fog Computing

Professional Elective - IV (Offered in Semester VII)		
Sl. No.	**Existing Course Titles**	**After 8th BoS – Approved Course Titles**
1	Full Stack Development	Six Sigma
2	Cyber Security and Forensics	Cyber Security and Forensics
3	Robotic Process Automation	Robotic Process Automation
4	Digital Image Processing	Digital Image Processing
5	Intrusion Detection System	Intrusion Detection System

Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Existing Course Titles**	**After 8th BoS – Approved Course Titles**
1	Quantum Computing	Cloud Services Management
2	Human Computer Interaction	Human Computer Interaction
3	GPU Computing	Bio-Inspired Computing
4	Automation Techniques and Tools	Storage Technologies
5	Augmented Reality and Virtual Reality	Augmented Reality and Virtual Reality

Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Existing Course Titles**	**After 8th BoS – Approved Course Titles**
1	Green Computing	Green Computing
2	Social Network Analysis	Generative AI
3	Wireless Sensor Networks	Wireless Sensor Networks
4	Computer Vision	Game Development
5	E-Commerce	E-Commerce

All the Changes carried as per suggestion of the members and the same has been confirmed.

Item:2025.9.3	To discuss the Syllabi of VII semester, under Autonomous Regulations R-2023 for the B. Tech - Information Technology students admitted from the Academic Year 2023-24

The BoS Members recommended to carry out the following changes in the VII Semester of Regulation 2023.

SEMESTER – VII

Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ITT710	Neural Network and Deep Learning	PC	3	0	0	3	25	75	100
2	U23ITT711	Cloud Computing and Virtualization	PC	3	0	0	3	25	75	100
3	U23ITT712	IT Operations and Management	PC	3	0	0	3	25	75	100
4	U23ITE7XX	Professional Elective IV #	PE	3	0	0	3	25	75	100
5	U23XXO7XX	Open Elective III $	OE	3	0	0	3	25	75	100
Practical										
6	U23ITP707	Neural Network and Deep Learning Laboratory	PC	0	0	2	1	50	50	100
7	U23ITP708	Cloud Computing and Virtualization Laboratory	PC	0	0	2	1	50	50	100
Project										
8	U23ITW703	Project Phase - I	PA	0	0	4	2	50	50	100
9	U23ITW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
							20	375	525	900

- The BoS members suggested to carry out the following

S.No.	Course Title	Category	Suggestion Provided	Changes Carried
1.	Neural Network and Deep Learning	PC	**Unit I: Neural Networks** Consider briefly mentioning Gradient Descent, Stochastic Gradient Descent (SGD), and Batch Normalization, as they are fundamental to neural networks. **Unit III: Deep Learning** RNN should include LSTMs (Long Short-Term Memory) Add a brief	Syllabus reframed as per the suggestion provided

					mention of Transformer Models like BERT and GPT **Unit IV:** Boltzmann Machines are powerful but less commonly used today. Consider briefly comparing them with modern deep learning architectures like GANs (Generative Adversarial Networks) and Autoencoders		
		2.	Cloud Computing and Virtualization	PC	**Unit I: Introduction** Add Cloud Deployment Models (Public, Private, Hybrid, Community Cloud) for a clearer understanding of cloud strategies. **Unit III: Virtualization** VM server consolidation topic can be included (As per the textbook considered) Include Containerization vs. Virtualization to differentiate between traditional VMs and modern containerized solutions. Add Hypervisors (Type 1 & Type 2) (e.g., VMware, KVM,	Syllabus reframed with the suggestions	

				Xen, Hyper-V) to explain how virtualization is implemented. **Unit- IV** Cloud Programming and Software Environments The most used cloud service provider AWS is not included	
	3.	Six Sigma	PE	Course Outcome statements are to be rephrased in line with the syllabus	Course Outcome statements are rephrased

The details of all the courses in VII Semester are given in **Annexure I**

Item:2025.9.4 **To discuss the B.Tech. Degree, Professional and Open Elective Courses selected for the VII semester under Regulation 2023 along with assessment methodologies**

Professional Elective - IV (Offered in Semester VII)

Sl. No.	Course Code	Course Title
1	U23ITE714	Six Sigma
2	U23ITE715	Cyber Security and Forensics
3	U23ECEC01	Digital Image Processing
4	U23ITE716	Intrusion Detection System
5	U23ITEC03	Robotic Process Automation

Open Elective – II (Offered in Semester VII)

S. No	Course Code	Course Title
1	U23ITOC03	Essentials of Data Science
2	U23ITOC04	Big Data Technologies

The details of the Professional and Open Elective courses are given in **Annexure II**

The assessment methodology for the Theory Courses, Practical Courses, Internship/Inplant Training, Project Phase I has been stated as per the regulation R23.

Item:2025.9.5	**To discuss the Syllabus of courses offered for Honors and Minor Degree Programme**

The Chairperson discussed about the Honors/Minor Degree (Advanced Web Development) to be floated by the department and showcased the syllabus of the subject listed under Honors Degree.

COURSE DETAILS

Sl. No.	Sem	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
					L	T	P		CAM	ESM	Total
Theory											
1	IV	U23WXT401	Front-End Development	PC	3	0	0	3	25	75	100
2	V	U23WXB501	Advanced Databases	PC	3	0	2	4	50	50	100
3	VI	U23WXB502	Microservices and Spring Boot	PC	3	0	2	4	50	50	100
4	VII	U23WXT702	Container Orchestration and Security	PC	3	0	0	3	25	75	100
5	VIII	U23WXT803	Cloud Management	PC	3	0	0	3	25	75	100
6	VIII	U23WXW801	Project Phase	PW	0	0	4	2	50	50	100
	Total							19*	225	375	600
Equivalent NPTEL courses##											
1	IV to VII	U23WXNX01	Web Development Equivalent NPTEL Courses					3	12 WEEK Course		

Details of Honors/Minor Degree and Syllabus in **Annexure III**

Item:2025.9.6	**To discuss the Assessment Methodology for the Honors and Minors Degree**

The assessment methodology for the Honors degree has been discussed as follows

Assessment Procedure and passing criteria for the courses under Honours and Minor Degree Programmes

The total marks for each course (comprising of two components namely Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM). Assessment and Examination procedures for the theory courses, theory cum practical and project courses under Honours / Minor Degree programmes shall be assessed as per Table 1, 2 and 3.

1. Theory Courses:

Table 1. Assessment Procedure for Theory Courses for Honours and Minor Degree Programmes

	Continuous Assessment Marks (CAM)					End Semester Examination##	Total Marks (CAM+ESE)
	CAT 1	CAT 2	Model##	Assignment#	Attendance##		
Portion for Test	2 Units	2 Units	All 5 Units			All 5 Units	
Assessment Methodology	MCQ Test	MCQ Test	Written Exam	Individual Task #		Written Exam	
	50 Questions for Analytical Course 75 Questions for Theory Course						
Duration of the Test	1 hour 30 Minutes	1 hour 30 Minutes	3 hours			3 hours	
Test Marks	50*	50*	75*	20*	5	75	
Weightage for CAM	5	5	5	5	5		
CAM / ESE Marks	CAM Marks = 25					ESE Marks = 75	100

\# Open Book Analytical Exam/Analyse Real world problems and propose solutions/ Tool or Subject Proficiency Analysis – Test the Students skill by giving individual task/ Paper Presentation/Micro Project Presentation/Idea Presentation for the Societal Problem;(Questions standard shall be of level 3 or more in Blooms Taxonomy)

Distribution of Marks for Attendance, the Question Paper Pattern for Model and ESE are same as given in B. Tech. Regulations R2023 for Theory Courses.

2. **Theory cum Practical Courses:**

Table 2. Assessment Procedure for Theory cum Practical Courses for Honours and Minor Degree Programmes

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks									**End Semester Examination (ESE) Marks (Theory)	Total Marks (CAM+ ESE)
	Continuous Assessment (Theory)					Continuous Assessment (Practical)					
	CAT 1	CAT 2	Model##	Attendance##	Total	Conduction of Practical	Report	Viva	Total	End Semester Examination (ESE) Marks (Practical)	
Portion for Test	1 ½ Units	1 ½ Units	All 3 Units							All 3 Units	
Assessment Methodology	MCQ Test	MCQ Test	Written Exam							Practical Exam	Written Exam
	50 Questions for Analytical Course 75 Questions for Theory Course										
Duration of the Test	1 hour 30 Minutes	1 hour 30 Minutes	3 hours							3 hours	3 hours
Marks	50	50	75	5		15	10	5	30*	30	*75 (To be weighted for 50 Marks)*
Weightage of CAM	2.5	2.5	2.5	2.5	10	**To be weighted for 10 Marks*			10	30	
CAM / ESE Marks	*CAM Marks =10+10+30=50*									*ESE Marks = 50*	100

Distribution of Marks for Attendance, the Question Paper Pattern for Model and ESE are same as given in B. Tech. Regulations R2023 for Theory cum practical Courses

Item:2025.9.7 **Details of Students Registered for Honors and Minors Degree**

The Chairperson showcased the registered list of students for the Honors Degree courses - Advanced Web Development & Artificial Intelligence and Machine Learning. The student list is given in **Annexure IV**

Item:2025.9.8 **To appraise about the methods to be adopted for Internship / Inplant Training**

7.14. Industrial Training / Internship

The student is required to undergo 'internship' in industry / research laboratory / higher learning institution for a minimum period of 4 weeks during vacations and shall complete the internship before the completion of 7th semester.

(i) The internship carries 1 credit.

(ii) Each spell of internship shall be for a period not less than 2 weeks.

(iii) The main purpose of internship is to enhance the general professional outlook and capability of the student to advance his/her chances of improving the career opportunities. The student should get prior approval from the Head of the Department and Training and Placement cell in the college before undertaking the internship and need to submit a detailed report after completion for the purpose of assessment. The internship marks will be given in 7th semester mark sheet.

Assessment Procedure

9.5. Industrial Training / Internship

9.5.1. The evaluation of 'Internship' is through internal assessment only (continuous assessment) as per Table 9.14.

9.5.2. A committee comprising of two faculty members appointed by Head of the Department will assess the internship for 100 marks.

Table 9.14 Assessment method for Industrial Training / Internship

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Report	Presentation	
Marks	50	50	100

Item:2025.9.9 **To Apprise about the Department Research Activities**

The Chairperson apprised about the recent research activities carried through Journal, Conference, Books/Chapters Publications, Patents and Consultancy work carried by the Faculties

Item:2025.9.10 **To Apprise about the End Semester Examination Results**

Item:2025.9.10	**To Apprise about the End Semester Examination Results**
	The Chairperson proudly stated that we are continuously maintaining more than 95% pass percentage in the previous years and the same has been continued this year also.
Item:2025.9.11	**To discuss about the remarkable Achievements of Faculty and Students**
	The Board of Studies Chairperson briefed the recent achievements of the College, Department Faculty and Students, along with the Placement track of the year 2024-2025
Item:2025.9.12	**Any other items to be discussed with the permission of the Chair**
	-

The meeting for the above Agenda regarding B.Tech - Information Technology was concluded by 4:30 pm by **Dr. R.Raju**, Chairperson-BoS and Head of Department, Department of Information Technology, Sri Manakula Vinayagar Engineering College.

Members Present

S.NO.	Name of the Member	Designation	Signature
1.Head of the Department Concern (Chairperson)			
1	**Dr. R. Raju** Professor & Head	Chairperson	
2.All faculty members of the Department			
2	**Dr. S. Balaji** Associate Professor	Member Secretary	
3	**Dr. R. Saravanan** Professor	Member	
4	**Dr. N. Thilagavathi** Associate Professor	Member	
5	**Dr. B. Vijayakumar** Associate Professor	Member	
6	**Dr. Puspita Dash** Associate Professor	Member	
7	**Dr. R. Anandkumar** Assistant Professor	Member	
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21	**Mrs. N. Nandhini** Assistant Professor	Member	
22	**Mr. R. Vijayaprabhu** Assistant Professor	Member	
23	**Mr. D. Prabhu** Assistant Professor	Member	

24	**Ms. M. Madhumitha** Assistant Professor	Member	
25	**Ms. A. Sowbarnika** Assistant Professor	Member	
26	**Mr. A. Ranjeeth** Assistant Professor	Member	
27	**Ms. V. Keerthana** Assistant Professor	Member	
28	**Dr.N.S.N. Cailassame** Professor & Dean Placement Department of Management Studies	Member	
29	**Dr. K. Karthikeyan** Associate Professor Department. of Chemistry	Member	
30	**Prof. M. Devanathan** Assistant Professor Department of Mathematics	Member	
31	**Dr. P. Jaichitra** Professor and Head Department of English	Member	
32	**Dr.T.Jayavarthanan** Professor Department. of Physics	Member	
3. Two subject experts from outside the Parent University			
33	**Dr. R.Manoharan, M. Tech., Ph.D.** Professor, Department of CSE Puducherry Technological University, Puducherry rmanoharan@pec.edu, 9443468480	Subject Expert	
34	**Dr. N.Pughazendi**, Professor, Department of CSE Panimalar Engineering College, Chennai pughazendi@gmail.com, 9962969429	Subject Expert	
4. Expert nominated by the Vice-Chancellor recommended by the Autonomous college Principal as a University Nominee			
35	**Dr. S. Kanmani** Professor, Department of Information Technology Puducherry Technological University, Puducherry kanmani@ptuniv.edu.in , 9443206299	Subject Expert	
5. One representative from industry areas to nominated by the Principal			
36	**Mr. Ashin Antony**, CTO, IGNITHO Technologies, Chennai-600018 ashin.antony@ignitho.com, 9444150791	Member	
6. One member of the College Alumni to be nominated by the principal			
37	**Dr. P. Victer Paul,** Senior Assistant Professor, Department of Computer Science and Engineering, Indian Institute of Information Technology, Kottayam victerpaul@iiitkottayam.ac.in , 9944913170	Member	

Dr. R. Raju
Chairperson - BoS (IT)

Annexure I

The details of all the courses in VII Semester

CURRICULUM R23

B.TECH. – INFORMATION TECHNOLOGY – VII SEMESTER

SEMESTER – VII										
Sl. No.	Course Code	Course Title	Cate-gory	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ITT710	Neural Network and Deep Learning	PC	3	0	0	3	25	75	100
2	U23ITT711	Cloud Computing and Virtualization	PC	3	0	0	3	25	75	100
3	U23ITT712	IT Operations and Management	PC	3	0	0	3	25	75	100
4	U23ITE7XX	Professional Elective IV #	PE	3	0	0	3	25	75	100
5	U23XXO7XX	Open Elective III $	OE	3	0	0	3	25	75	100
Practical										
6	U23ITP707	Neural Network and Deep Learning Laboratory	PC	0	0	2	1	50	50	100
7	U23ITP708	Cloud Computing and Virtualization Laboratory	PC	0	0	2	1	50	50	100
Project										
8	U23ITW703	Project Phase - I	PA	0	0	4	2	50	50	100
9	U23ITW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
							20	375	525	900

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23ITT710**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Neural Network and Deep Learning**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								

Prerequisite	Computer Networks	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 To understand Neural Network basics and Types	**K2**
	CO2 To understand various neural network models	**K2**
	CO3 Implement the deep learning techniques using software tools.	**K3**
	CO4 To analyze the Spin Glass Model and Deep Belief Networks	**K2**
	CO5 To Develop smart applications for various domains	**K3**

Unit- I	**Neural Networks**	**Periods: 09**
Overview of biological neurons: Structure of biological neuron - neurobiological analogy - Biological neuron equivalencies to artificial neuron model - Evolution of neural network. Terminologies: Learning rate - Bias - Variance - underfitting - Overfitting. Activation Function: Binary step – Linear – ReLU – LeakyReLU – Sigmoid – Tanh – Softmax – Gradient Descent and Stochastic Gradient Descent - ANN Architecture: Feed forward network - Feed backward network - Single and multilayer network - fully recurrent network		**CO1**
Unit- II	**Models of Neural Network**	**Periods: 09**
McCulloch and Pits Neural Network (MCP Model): Architecture - Solution of AND, OR function using MCP model - Hebb Model: Architecture - training and testing - Hebb network for AND function. Perceptron Network: Architecture – training – Testing - single and multi-output model - Perceptron for AND function		**CO2**
Unit- III	**Deep Learning**	**Periods: 09**
Deep Learning - Different types of Deep Neural Networks - CNN - RNN - LSTM - forward propagation - Cost function - backpropagation. APIs using Softwares Tensorflow and Keras		**CO3**
Unit- IV	**Boltzmann Machines**	**Periods: 09**
Introduction to Boltzmann Machine - Energy-Based Models - Restricted Boltzmann Machine - Contrastive Divergence - Deep Belief Networks - Deep Boltzmann Machine - Basics of Generative adversarial Networks and Autoencoders		**CO4**
Unit- V	**Smart Applications**	**Periods: 09**
Smart Agriculture - Smart Transportation and Autonomous Vehicles - Smart Homes - Smart Cities - Image Processing - Natural Language Processing - Speech Recognition - Video Analytics		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola, "Dive into Deep Learning", Amazon Science,2022.
2. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.
3. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.
4. AurélienGéron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017.

Reference Books

1. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.
2. 2. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.
3. 3. Joshua F. Wiley, "R Deep Learning Essentials", Packt Publications, 2016.

Web References

1. https://www.geeksforgeeks.org/artificial-neural-networks-and-its-applications/
2. https://www.coursera.org/learn/neural-networks-deep-learning
3. https://onlinecourses.nptel.ac.in/noc20_cs62/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
2	3	3	3	-	3	2	-	-	-	-	-	-	3	2	2
3	3	3	2	2	2	-	-	-	-	-	-	-	3	2	1
4	3	2	2	2	-	-	-	-	-	-	-	-	3	1	1
5	3	2	2	-	-	-	-	-	-	-	-	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			*End Semester Exam Type:**TE**			
Course Code	**U23ITT711**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Cloud Computing and Virtualization**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
IT								
Prerequisite	Internet Programming, Data communication and Computer Networks							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 To understand the fundamentals of Cloud Computing and its evolution	**K2**
	CO2 To understand the cloud infrastructures	**K2**
	CO3 To gain knowledge on the concept of virtualization that is fundamental to cloud computing	**K3**
	CO4 To learn programming and software environments for cloud	**K2**
	CO5 To understand the security issues in cloud computing	**K3**

Unit- I	**Introduction**	**Periods: 09**
Technologies for Network based systems - System Models for Distributed and Cloud Computing - NIST Cloud Computing Reference Architecture - Reference Architectural Components - Cloud Computing and Service Models - Cloud Computing Characteristics - Cloud Services - Cloud Models (IaaS, PaaS, SaaS) - Cloud Ecosystem and enabling technologies		**CO1**

Unit- II	**Cloud Infrastructure**	**Periods: 09**
Architectural Design of Compute and Storage Clouds - Layered Cloud Architecture Development - Design Challenges - Inter Cloud Resource Management - Resource Provisioning and Platform Deployment - Global Exchange of Cloud Resources		**CO2**

Unit- III	**Virtualization**	**Periods: 09**
Introduction - Implementation Levels of Virtualization - Virtualization Structures/Tools and Mechanisms - Virtualization of CPU - Memory and I/0 Devices - Virtual Cluster and Resource Management - Virtualization for Data Center Automation – Hypervisor- VMware		**CO3**

Unit- IV	**Cloud Programming and Software Environments**	**Periods: 09**
Parallel and Distributed Programming paradigms – Programming on Amazon AWS and Microsoft Azure – Programming support of Google App Engine – Emerging Cloud software Environment.		**CO4**

Unit- V	**Security**	**Periods: 09**
Security management in Peer-to-Peer networks - Peer trust and Reputation Systems - Trust overlay and DHT implementation - Power Trust - Securing Overlays. Cloud Security and Trust Management - Defense Strategies - Distributed Intrusion Detection - Data and Software Protection Techniques		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Douglas Comer, "The Cloud Computing Book - The Future of Computing Explained", CRC Press, 1st Edition, 2021.
2. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2012.
3. Barrie Sosinsky, "Cloud Computing Bible", John Wiley & Sons, 2010.
4. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly, 2009.

Reference Books

1. Chris Dotson ,"Practical Cloud Security: A Guide For Secure Design and Deployment",1st Edition,2019.
2. Michael Wittig and Andreas Wittig," Amazon Web Services in Action",2nd Edition,2018.
3. Arshdeep Bahga and Vijay Madisetti," Cloud Computing: A Hands-On Approach",1st Edition,2013.

Web References

1. https://www.simplilearn.com/tutorials/cloud-computing-resources/cloud-computing-material/
2. https://www.ncsc.gov.uk/collection/cloud/choosing-a-cloud-provider/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	-	2	-	-	-	-	-	3	3	3
2	3	3	3	2	2	2	-	-	-	-	-	2	3	2	2
3	3	3	2	2	2	2	-	-	-	-	-	2	3	2	1
4	3	2	2	2	3	2	-	-	-	-	-	2	3	1	1
5	3	2	2	2	3	3	2	-	-	-	-	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Information Technology	Programme: B.Tech.						
Semester	VII	Course Category Code: PC				*End Semester Exam Type:TE		
CourseCode	U23ITT712	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	IT Operations and Management	3	0	0	3	25	75	100
IT								
Prerequisite	Operating Systems, Database Management Systems							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Identify the commands to manage user and group administrative structure, File system, devices and kernels in a standalone or network system	K1
CO2	Apply the essential Windows administration concepts for given scenario.	K3
CO3	Describe the functionalities, Configuration, monitoring and Power budget for different types of servers	K2
CO4	To Explain various storage networking and virtualization technologies	K2
CO5	Review backup and restore strategy used in a system or enterprise	K2

Unit-I	Linux Administration	Periods:09	
Essential duties of system admin-Scripting – Shell - Shell Configuration - Access control and Root powers- Adding new users- Controlling Process- File system- Devices- Modules- Drivers and kernel - Network file system - sharing system files			CO1
Unit-II	**Windows Administration**	**Periods:09**	
Managing account policies and service accounts- Configuring Name resolution- Active directory- Network policies- Remote access- Managing File services			CO2
Unit-III	**Server Management**	**Periods:09**	
Types of servers - Roles of Server - Web Server Management – Mail server Management - Setup - Monitoring - Optimization - Power and Heat budgeting			CO3
Unit-IV	**Storage Management**	**Periods:09**	
Information availability - Networked Storage Infrastructures (NAS, SAN) - RAID - Storage Virtualization			CO4
Unit-V	**Business Continuity**	**Periods:09**	
System Backup management- Enterprise Back-up and Recovery: Considerations , Operations - Backup Granularity, Methods, Technologies - Replication - Business Continuity Planning			CO5

Lecture Periods:45	Tutorial Periods:	Practical Periods:-	Total Periods:45

Text Books

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, "UNIX and Linux System Administration Handbook", 5th edition, Pearson education,2017.
2. Orin Thomas, "Administering Windows Server 2012 – Training guide", O'Reilly Media, 2014
3. EMC Education Services," Information Storage and Management", Wiley, 2nd edition, 2012
4. Gilbert Held, "Server Management (Best Practices Book 9)", Auerbach Publications, 1st edition.2000

Reference Books

1. Robert Spalding, "Storage Networks :The Complete Reference", Tata McGraw Hill,Osborne,2017.
2. Matthias KalleDalheimer, Matt Welsh, "Running Linux", Om books, Fifth Edition, 2006.
3. Nicholas Wells, "Guide to Linux Installation and Administration", Course Technology Inc; 2nd Revised edition, 2003.

Web References

1. Backup management-https://www.baculasystems.com/training
2. System administration and engineering training - https://www.cbtnuggets.com/it training/systems-administration-engineering
3. System administration certification - https://www.kocnig solutions.com/specialization/system-administration-training-courses.aspx

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	-	3	-	-	-	-	-	-	1	2	2
2	3	2	1	-	-	2	-	1	-	-	-	-	1	2	2
3	3	2	1	-	-	2	-	-	-	-	-	-	1	2	2
4	3	2	1	-	-	3	-	-	-	-	-	-	1	2	2
5	3	2	1	-	-	-	2	2	-	2	-	-	1	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Information Technology	Programme: B.Tech.						
Semester	VII	Course Category Code: PC			*End Semester Exam Type: LE			
Course Code	U23ITP707	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Neural Network and Deep Learning Laboratory	-	-	2	1	50	50	100
IT								

Prerequisite	Machine Learning	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Implement various Activation functions	K3
CO2	Develop various NN models	K3
CO3	Design and configure Neural Networks for various real world applications	K3
CO4	To design various neural networks	K3
CO5	To create convolution neural network model for image classification	K3

List of Exercise

1. Plotting of Activation Functions: Threshold functions, Signum function, Sigmoid function, Tan-hyperbolic function, Ramp function, Identity function.
2. Implementation of some basic model like MCP with suitable example.
3. Implementation of Hebb model with suitable example.
4. Write a program for Time-Series Forecasting with the LSTM Model.
5. Build a feed forward neural network for prediction of logic gates.
6. Write a program to implement deep learning Techniques for image segmentation
7. Write a program to predict a caption for a sample image using LSTM.
8. Write a program for character recognition using CNN.
9. Build a Convolutional Neural Network for Cat vs Dog Image Classification
10. Implement un-regularized and regularized versions of the neural network cost function and compute gradients via the backpropagation algorithm.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 30	Total Periods: 30

Text Books

1. Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola, "Dive into Deep Learning", Amazon Science,2022.
2. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018
3. AurélienGéron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
4. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017

Reference Books

1. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018
2. 2. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018
3. 3. Joshua F. Wiley, "R Deep Learning Essentials", Packt Publications, 2016

Web References

1. https://www.geeksforgeeks.org/artificial-neural-networks-and-its-applications/
2. https://www.coursera.org/learn/neural-networks-deep-learning
3. https://onlinecourses.nptel.ac.in/noc20_cs62/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	2	-	-	1	2	-	-	3	3	3	3
2	3	3	2	-	2	-	-	2	2	-	-	3	3	3	3
3	3	3	3	-	2	-	-	2	2	-	-	3	3	3	3
4	3	3	3	-	3	-	-	2	2	-	-	3	3	3	3
5	3	3	3	2	3	-	-	2	2	-	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Information Technology	Programme: B.Tech.						
Semester	VII	Course Category Code: PC			*End Semester Exam Type: LE			
Course Code	U23ITP708	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Cloud Computing and Virtualization Laboratory	-	-	2	1	50	50	100
IT								

Prerequisite	Computer Networks, Virtualization	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 To provide hands-on experience with cloud computing platforms, virtualization technologies	K3
	CO2 To provide hands-on experience with cloud-based software development	K3
	CO3 To learn how to configure, deploy, and manage cloud services	K3
	CO4 To provide hands-on experience with virtualization tools	K3
	CO5 To understand the security Policies in Cloud Environments	K3

List of Exercise

1. Installation and Configuration of CloudSim
2. Exploring Cloud Service Models
3. Exploring and Setting up a Private Cloud using OpenStack
4. Implement Resource Provisioning in the Cloud
5. Installation and Configuration of Virtual Machine Creation using VMware/Virtual Box
6. Working with Docker Containers
7. Implement Kubernetes for Container Orchestration
8. Build a Hadoop and HDFS environment
9. Write a MapReduce Programs
10. Deploying Applications on Microsoft Azure and Google Cloud
11. Configuring security groups and IAM roles in AWS/Azure
12. Implementing multi-factor authentication.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 30	Total Periods: 30

Text Books

1. Kris Jamsa ,Cloud Computing, Jones & Bartlett Learning,2022.
2. Dac-Nhuong Le, "Cloud Computing and Virtualization", Wiley-Scrivener, 2018
3. Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, Joe Topjian, OpenStack Operations Guide, O'Reilly Media,2014.
4. Matthew Portnoy, Virtualization Essentials, Published by Sybex,2012.

Reference Books

1. Rodrigo N. Calheiros, Rajiv Ranjan, Anton Beloglazov, Cesar A. F. De Rose, and Rajkumar Buyya, CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms, Software: Practice and Experience, Volume 41, Number 1, Pages: 23-50, ISSN: 0038-0644, Wiley Press, New York, USA, January 2011.
2. Rajkumar Buyya, Rajiv Ranjan and Rodrigo N. Calheiros, Modeling and Simulation of Scalable Cloud Computing Environments and the CloudSim Toolkit: Challenges and Opportunities, Proceedings of the 7th High Performance Computing and Simulation Conference (HPCS 2009, ISBN: 978-1-4244-4907-1, IEEE Press, New York, USA), Leipzig, Germany, June 21 - 24, 2009.

Web References

1. https://www.openstack.org
2. https://hadoop.apache.org
3. https://hadoop.apache.org/docs/r1.2.1/mapred_tutorial.html
4. https://aws.amazon.com/free/
5. https://azure.microsoft.com/en-us/free/
6. https://cloud.google.com/free

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	2	-	-	1	2	-	-	3	3	3	3
2	3	3	2	-	2	-	-	2	2	-	-	3	3	3	3
3	3	3	3	-	2	-	-	2	2	-	-	3	3	3	3
4	3	3	3	-	3	-	-	2	2	-	-	3	3	3	3
5	3	3	3	2	3	-	-	2	2	-	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PA**			*End Semester Exam Type: **LE**			
Course Code	**U23ITW703**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**PROJECT PHASE-I**	**0**	**0**	**4**	**2**	**50**	**50**	**100**

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 State the problem definition clearly.	**K3**
	CO2 Prepare SRS for projects.	**K3**
	CO3 Prepare SDS for projects.	**K3**
	CO4 Develop presentation skills.	**K3**
	CO5 Develop project management skills.	**K3**

List of Exercise

The project group is required to do the following

- literature survey,
- Problem formulation
- Forming a methodology of arriving at the solution of the problem.
- Documentation of each step

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

- Papers published in reputed journals, conferences related to the project

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PA**			*End Semester Exam Type: -			
Course Code	**U23ITW704**	Periods / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**INTERNSHIP/INPLANT TRAINING**	**0**	**0**	**2**	**1**	**100**	**-**	**100**
IT								

In the course of study, during 6th semester holidays, each student is expected to undertake a minimum of 4 Industrial visits (leading hardware manufacturing / software development companies) and 2 week training or undertake a minimum of one month of industry internship (in a reputed concern). Based on the industrial internships / training/visits, the student has to submit a report at the end of seventh semester highlighting the exposure he/she gained. The report will be evaluated by the departmental committee for 100 marks. More weightage will be given for Internship. The proofs for having undergone visits / training are to be enclosed along with report as enclosures.

Annexure II

The details of Professional and Open Elective courses in VII Semester

Department	Information Technology	Programme: B.Tech.					
Semester	VII	Course Category Code: PE			*End Semester Exam Type: TE		
Course Code	U23ITE714	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Six Sigma	3	0	0	3	25	75	100
IT								
Prerequisite	Software Engineering and Project Management							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Identify the roles and responsibilities of different Six Sigma professionals	K2
CO2	Identify customer requirements, select and scope Six Sigma projects	K2
CO3	Gain proficiency in basic statistical concepts	K3
CO4	Understand how to conduct Regression Analysis and Correlation for process improvement.	K3
CO5	Analyze case studies on successful Six Sigma implementations and apply lessons learned to real-world scenarios.	K4

Unit- I	Introduction to Six Sigma and Quality Management	Periods: 09	
Evolution of Quality Management (TQM, Lean, Six Sigma) - Basics of Six Sigma: Definition, Principles, and Benefits - Overview of DMAIC & DMADV Methodologies - Cost of Poor Quality (COPQ) and Defect Reduction - Roles and Responsibilities in Six Sigma (Green Belt, Black Belt, Master Black Belt) - Six Sigma Metrics: DPMO, Sigma Level, Yield, RTY.			CO1
Unit- II	**Define Phase**	**Periods: 09**	
Identifying Customer Requirements (Voice of the Customer - VOC) - Project Selection and Scoping - Critical to Quality (CTQ) Characteristics - SIPOC (Suppliers, Inputs, Process, Outputs, Customers) Model - Problem-Solving Tools: Flowcharts, Pareto Charts - Project Charter and Goal Setting.			CO2
Unit- III	**Measure Phase**	**Periods: 09**	
Data Collection Techniques and Measurement Scales - Measurement System Analysis (MSA): Gage R&R - Basic Statistical Concepts: Mean, Median, Mode, Variance, Standard Deviation - Statistical Process Control (SPC) & Control Charts - Process Capability Analysis: Cp, Cpk, Pp, Ppk - Understanding Process Variability and Defect Measurement.			CO3
Unit- IV	**Analyze and Improve Phase**	**Periods: 09**	
Root Cause Analysis (5 Whys, Fishbone Diagram) - Hypothesis Testing (t-test, ANOVA, Chi-square) - Regression Analysis and Correlation - Design of Experiments (DOE) – Full Factorial and Fractional Factorial Designs - Introduction to Lean Principles: 5S, Waste Reduction, Value Stream Mapping - Improvement Strategies: Kaizen, Poka-Yoke, SMED.			CO4
Unit- V	**Control Phase and Implementation**	**Periods: 09**	
Control Plans and Documentation - Statistical Process Control (SPC) and Control Charts (X-Bar, R, P, C Charts) - Failure Mode and Effects Analysis (FMEA) - Risk Assessment and Mitigation Strategies - Six Sigma Certification Levels and Industry Applications - Case Studies on Successful Six Sigma Implementations.			CO5
Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Douglas C. Montgomery, "Introduction to Statistical Quality Control", 8th Edition, Wiley, 2019.
2. Thomas Pyzdek & Paul Keller, "The Six Sigma Handbook", 5th Edition, McGraw Hill, 2018.
3. Craig Gygi, Bruce Williams, Neil DeCarlo, "Six Sigma for Dummies", 2nd Edition, Wiley, 2017.

Reference Books

1. John Morgan & Martin Brenig-Jones, "Lean Six Sigma for Dummies", 3rd Edition, For Dummies, 2015.
2. Joseph M. Juran & Joseph A. Defeo, "Juran's Quality Handbook", 6th Edition McGraw-Hill Education, 2010.
3. Michael L. George, "Lean Six Sigma: Combining Six Sigma Quality with Lean Production Speed", NIBM E-Library, 2002.

Web References

1. https://www.asq.org/
2. https:// www.isixsigma.com/
3. https:// www.lean.org/
4. https:// www.nist.gov/
5. https://www.coursera.org/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	-	-	-	-	-	-	-	3	-	3	3	3	3
2	3	3	3	-	2	-	-	-	3	3	2	3	3	3	3
3	3	3	2	2	2	-	-	-	-	3	3	3	3	3	3
4	3	2	2	2	2	3	3	-	3	3	3	3	3	3	3
5	3	2	2	2	2	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Information Technology	Programme: B.Tech.						
Semester	VII	Course Category Code: PE				*End Semester Exam Type: TE		
Course Code	U23ITE715	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Cyber Security and Forensics	3	0	0	3	25	75	100
IT								
Prerequisite	Data Communication and Computer Networks							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Apply appropriate security controls and authentication measures to protect computer systems and user data, considering common threats and vulnerabilities.	K2
CO2	Understand and implement privacy measures in cyberspace, incorporating principles of confidentiality, integrity, and availability.	K2
CO3	Identify and mitigate cyber threats and understanding of various attack methods, tools, and security measures. Develop strategies to secure networks, cloud environments and web applications.	K2
CO4	Acquire knowledge and skills in utilizing different types of computer forensics, Understand the importance of data recovery, backup, and evidence capture in forensic investigations.	K2
CO5	Develop the ability to conduct effective computer forensics analysis and validation.	K2

Unit- I	Introduction to Cybersecurity	Periods: 09	
Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication -Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks			CO1
Unit- II	**Privacy in Cyberspace**	**Periods: 09**	
Identifying Customer Requirements (Voice of the Customer - VOC) - Project Selection and Scoping - Critical to Quality (CTQ) Characteristics - SIPOC (Suppliers, Inputs, Process, Outputs, Customers) Model - Problem-Solving Tools: Flowcharts, Pareto Charts - Project Charter and Goal Setting.			CO2
Unit- III	**Cyber Crimes and Cyber Security**	**Periods: 09**	
Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods – Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security.			CO3
Unit- IV	**Types of Computer Forensics Technology**	**Periods: 09**	
Types of Computer Forensics Technology: - Types of Business Computer Forensic Technology. Types of Military Computer Forensic Technology, Types of Law Enforcement- Computer Forensic Technology, Types of Business Computer Forensic Technology. Computer Forensics Evidence and capture: Data Recovery Defined-Data Back-up and Recovery-The Role of Back -up in Data Recovery-The Data - Recovery Solution.			CO4
Unit- V	**Computer Forensics Analysis and Validation**	**Periods: 09**	
Computer Forensics Evidence and capture: Data Recovery Defined-Data Back-up and Recovery-The Role of Back -up in Data Recovery-The Data -Recovery Solution. Computer forensic analysis and validation: Determining what data to collect and analyse, validating forensic data, addressing data-hiding techniques, performing remote acquisitions..			CO5
Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Charles P. Pleeger Shari Lawrence Pleeger Jonathan Margulies, Security in Computing, 7th Edition , Pearson Education , 2022
2. Computer Forensics, Computer Crime Investigation by John R,Vacca, Firewall Media, New Delhi. First Edition 2015
3. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.

Reference Books

1. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015.
2. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
3. Nelson Phillips and Eninger Steuart, —Computer Forensics and Investigationsl, Cengage Learning, New Delhi, 2009.

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1. https://www.nist.gov/cyberframework
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/
3. https://www.cisa.gov/
4. https://owasp.org/
5. https://www.eff.org/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	-	-	3	-	-	-	-	3	-	3	3	3	3
2	3	3	-	-	2	2	-	2	3	3	2	3	3	3	3
3	3	3	-	2	2	3	3	3	-	3	3	3	3	3	3
4	3	3	3	3	2	3	-	3	3	3	3	3	3	3	3
5	3	2	2	2	2	3	-	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Electronics and Communication Engineering	Programme: **B.Tech.**						
Semester	VII	Course Category: **PE**			End Semester Exam: **TE**			
Course Code	U23ECEC01	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Digital Image Processing**	3	-	-	3	25	75	100
Common to ECE and IT								
Prerequisite	Basic Electronics, Computer Networks, Embedded Systems and Programming Knowledge.							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
CO1	Describe the basics of digital image processing, including acquisition and sampling.	**K1**
CO2	Explain image transforms like Fourier, Walsh, and Discrete Cosine Transform.	**K2**
CO3	Apply spatial and frequency domain methods for image enhancement.	**K3**
CO4	Explain techniques for image restoration and segmentation.	**K2**
CO5	Describe compression methods, including error-free and lossy techniques.	**K1**

UNIT-I	**DIGITAL IMAGE FUNDAMENTALS**	**Periods:9**
Digital Image Fundamentals: Origins of Digital Image Processing- Fundamental Steps in Digital Image Processing- Components of an Image Processing System- Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels.		**CO1**
UNIT-II	**IMAGE TRANSFORMS**	**Periods:9**
2-D Fourier Transform-Walsh Transform-Hadamard Transform- Discrete Cosine Transform-Haar transform- Slant transform-Hotelling transform.		**CO2**
UNIT-III	**IMAGE ENHANCEMENT**	**Periods:9**
Enhancement in Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Filters. Enhancement in Frequency Domain: **Introduction to Fourier Transform:** Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering.		**CO3**
UNIT-IV	**IMAGE RESTORATION AND SEGMENTATION**	**Periods:9**
Image Restoration- Model of the Image Degradation/Restoration Process, Noise Models, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering. **Image Segmentation**-Detection of discontinuities - Edge linking and boundary detection - Thresholding: Global and Optimal Thresholding – Region based segmentation.		**CO4**
UNIT-V	**IMAGE COMPRESSION**	**Periods:9**
Fundamentals: Coding, Interpixel, Psycho visual Redundancies, Fidelity Criteria – Image Compression Models- Error Free Compression: Arithmetic coding, Huffman coding- Lossy and Lossless Predictive Coding-JPEG 2000 Standards.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Textbooks

1. Kenneth R. Castleman, Digital Image Processing Pearson, 2nd Edition, 2020.
2. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", 2nd Edition, PHI Learning Pvt. Ltd., 2019.
3. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, 4th Edition, 2018.

Reference Books

1. John C. Russ, F. Brent Neal-The Image Processing Handbook, 7th Edition, CRC Press, Taylor & Francis Group. 2016
2. William K. Pratt, Digital Image Processing John Wiley, New York, 2002
3. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999
4. D.E.Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.

Web References

1. http://eeweb.poly.edu/~onur/lectures/lectures.html
2. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html 3. https://nptel.ac.in/courses/117/105/117105079/
3. https://nptel.ac.in/courses/117/105/117105135/
4. https://www.csie.nuk.edu.tw/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	-	-	-	-	3	2	3
2	3	2	2	2	-	-	-	-	-	-	-	-	3	2	3
3	3	2	2	3	-	-	-	-	-	-	-	-	3	2	3
4	3	2	3	2	-	-	-	-	-	-	-	-	3	2	3
5	3	2	3	2	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment		Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Information Technology	Programme: B.Tech.						
Semester	VII	Course Category Code: PE				*End Semester Exam Type: TE		
Course Code	U23ITE716	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Intrusion Detection System	3	0	0	3	25	75	100
IT								

Prerequisite	Operating Systems and Computer Networks	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Explain the basic concepts of intrusion detection systems.	K2
CO2	Understand Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.	K2
CO3	Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.	K2
CO4	Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.	K3
CO5	Build agent development for intrusion detection and architectural models of IDs and IPs.	K3

Unit- I	Introduction	Periods: 09
History of Intrusion Detection: Audit, Concept and definition, Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.		CO1
Unit- II	**Intrusion Prevention Systems**	**Periods: 09**
Network IDs protocol based IDs ,Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis , techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis.		CO2
Unit- III	**Introduction to Snort**	**Periods: 09**
Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.		CO3
Unit- IV	**Snort Rules**	**Periods: 09**
Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Preprocessors and Output Modules, Using Snort with MySQL.		CO4
Unit- V	**Snort Snarf with Snort**	**Periods: 09**
Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Rafeeq Ur Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003.

Reference Books

1. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander " Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak : "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002.
4. T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.

Web References

1. https://www.udemy.com/course/snort-ids/
2. https://www.coursera.org/articles/intrusion-detection-system
3. https://en.wikipedia.org/wiki/Intrusion_detection_system
4. https://www.techtarget.com/searchsecurity/definition/intrusion-detection-system

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	-	3	-	2	2	-	-	-	-	2	2	2	2
2	2	2	2	3	-	3	2	-	-	-	-	2	2	2	2
3	2	2	2	3	2	2	3	-	-	-	-	2	3	2	2
4	2	2	2	3	2	2	3	-	-	-	-	2	3	2	2
5	2	2	2	3	2	-	-	-	-	-	-	2	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Information Technology	Programme: B.Tech.						
Semester	VII	Course Category Code: PE				*End Semester Exam Type: TE		
Course Code	U23ITEC03	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Robotic Process Automation	3	-	-	3	25	75	100
Common to IT and CCE								
Prerequisite	IT Essentials							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the basics of Robotic Process Automation and UiPath Studio	K2
CO2	Apply the different types of variables, control flow and data manipulation techniques	K3
CO3	Manipulate the controls available in UiPath and extract data	K3
CO4	Use events handling and exception handling	K3
CO5	Explain the code management, deployment and maintenance of the bot	K2

UNIT-I	Introduction to Robotic Process Automation	Periods:9	
Scope and techniques of automation, Robotic process automation - Benefits of RPA - Components of RPA - RPA platforms - The future of automation - UiPath stack- Learning UiPath Studio- Task Recorder			CO1
UNIT-II	**Automation Process Activities**	**Periods:9**	
Sequence, Flowchart & Control Flow: Sequencing the Workflow – Activities – Flowchart - Control Flow for Decision making. Data Manipulation: Variables – Collection – Arguments - Data Table - Clipboard management - File operations - CSV/Excel to data table and vice versa			CO2
UNIT-III	**Controls**	**Periods:9**	
Finding and attaching windows - Finding the control - waiting for a control - Act on a control - UiExplorer - Handling Events - Recorder: Desktop recording - Web recording - Screen Scraping - OCR			CO3
UNIT-IV	**Handling Events and Exceptions**	**Periods:9**	
Assistant bots, Monitoring triggers - Launching an assistant bot on a keyboard event. Exception Handling - Common exception handling - Loggin and taking screenshots - Debugging techniques - Collecting crash dumps - Error reporting.			CO4
UNIT-V	**Code Management, Deployment and Maintenance**	**Periods:9**	
Project Organization, Nesting workflows - Reusablity of workflows – Templates - Commenting techniques - State Machine. Publishing using publish utility - Orchestration Server - Control bots - Orchestration Server to deploy bots - License management - Publishing and managing updates.			CO5

Lecture Periods:45	Tutorial Periods: -	Practical Periods:-	Total Periods:45

Text Books

1. Tom Taulli , "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress publications, 2020.
2. Alok Mani Tripathi, Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath, Packt Publishing, 2018.

Reference Books

1. Nandan Mullakara, Arun Kumar Asokan, Robotic Process Automation Projects, Packt Publishing, ISBN: 9781839217357, May 2020
2. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018
3. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018

Web References

1. https://www.scribd.com/document/442266295/Sanet-st-Learning-Robotic-Proc-pdf
2. https://www.uipath.com/rpa/robotic-process-automation/
3. https://www.academy.uipath.com/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	2	-	-	-	-	-	-	-	2	2	-
2	3	2	-	-	3	-	-	-	-	-	-	-	3	3	-
3	3	2	-	-	3	-	-	-	-	-	-	-	3	3	-
4	3	2	-	-	3	-	-	-	-	-	-	-	3	3	-
5	2	1	-	-	2	-	-	-	-	-	-	-	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **OE**				*End SemesterExamType:**TE**		
Course Code	**U23ITOC03**	Periods/Week			Credit	MaximumMarks		
Course Name	**Essentials of Data Science**	**L**	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
	EEE,ECE,ICE,CCE,BME,CIVIL,MECH,MCTR	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Mathematics							

Course Outcomes	**On completion of the course, the students will be able to**	**BT Mapping (Highest Level)**
	CO1 Ability to have a broad insight, understanding and intuition of the data science life cycle	**K2**
	CO2 Create artful graphs to visualize complex data sets and functions.	**K3**
	CO3 Discuss in depth a variety of data mining techniques, and their applicability to various problem domains	**K2**
	CO4 Select and apply data mining technique to a practical case study	**K2**
	CO5 Understand the concept, challenge and technology of big data	**K2**

Unit-I	**Introduction to Data Science**	**Periods:09**	**CO1**

Introduction: Need for data science – Benefits and uses – Facets of data-Data science process: Retrieving data – Cleansing, integrating, and transforming data – Data analysis – Build the models -Epicycles of Analysis- Exploratory Data Analysis- Using Models to Explore Data-Inference: A Primer- Formal Modeling-Inference vs. Prediction : Implications for Modeling Strategy -Interpreting results.

Unit-II	**Data Analytics Using R**	**Periods:09**	CO2

Introduction to R: Data structures, vectors, matrices, data frames–Exploratory Data Analysis: Descriptive statistics, Data visualization with ggplot2, Correlation and covariance analysis Statistical – Hypothesis testing- Analysis of variance (ANOVA)- Regression analysis-Processing and analyzing text data -Association rule mining - Clustering techniques

Unit-III	**Supervised Learning**	**Periods:09**	**CO3**

Regression - Linear Regression - Logistic Regression - Reasons to Choose and Cautions - Additional Regression Models - Classification - Decision Trees – Na'ive Bayes – Diagnostics of Classifiers – Additional Classification Methods – Time Series Analysis – Overview of Time Series Analysis – ARIMA Model

Unit-IV	**Unsupervised Learning**	**Periods:09**	**CO4**

Clustering - Overview of Clustering – K-means - Additional Algorithms –Association Rules- Overview - A priori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Validation and Testing – Diagnostics - Text Analysis – Text Analysis Steps – Collecting Raw Text – Representing Text – Term Frequency-Inverse Document Frequency (TFIDF) - Categorizing Documents by Topics –Determining Sentiments – Gaining Insights

Unit-V	**Big Data Analytics**	**Periods:09**	**CO5**

Data science in a Big Data world - Benefits and uses of data science and Big Data - Facets of data - The Big Data ecosystem and data science – Introduction of Hadoop - Handling large data on a single computer - The problems in handling large data - General techniques for handling large volumes of data - General programming tips for dealing with large datasets- Case study : Predicting malicious URLs, Recommender system - Steps in Big Data - Distributing data storage and processing with frameworks - Case study: Assessing loan risk.

LecturePeriods:45	**TutorialPeriods:**	**PracticalPeriods:-**	**TotalPeriods:45**

TextBooks

1. Peng, R. D., & Matsui. E, The Art of Data Science- A Guide for Anyone Who Works with Data, Skybrude Consulting, 2015.
2. David Dietrich, Barry Heller & Beibei Yang, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, John Wiley & Sons, 2015.
3. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.

ReferenceBooks

1. Steven S. Skiena, The Data Science Design Manual, First Edition, Springer, 2017.
2. Davy Cielen, Arno Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Manning Publications, 2016.
3. Joel Grus, Data science from scratch: first principles with python, O'Reilly Media, Inc., 2015.
4. Martin Czygan, Phuong Vo.T.H, Getting Started with Python Data Analysis, Packt Publishing, 2015.

Web References

1. www.ibm.com/Data Analytics/
2. https://www.coursera.org/learn/r-programming
3. https://www.ijser.org/researchpaper/Importance-of-Clustering-in-Data-Mining.pdf
4. https://datafloq.com/read/7-innovative-uses-of-clustering-algorithms/6224
5. https://publications.waset.org/10011058/improving-fake-news-detection-using-k-means-and-support- vector-machine-approaches
6. https://statisticsbyjim.com/regression/when-use-regression-analysis/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	-	-	-	-	-	-	-	-	3	3	3
2	3	3	3	2	2	2	-	-	-	-	-	-	3	2	3
3	3	3	3	2	2	3	3	-	-	-	-	-	3	2	1
4	3	2	2	2	2	3	-	-	-	-	-	-	3	2	1
5	3	2	2	2	2	3	-	-	-	-	-	-	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	Information Technology	Programme:B.Tech.						
Semester	VII	Course Category Code:OE				*End SemesterExamType:TE		
CourseCode	U23ITOC04	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CAM	ESE	TM
Course Name	Big Data Technologies	3	0	0	3	25	75	100
EEE,ECE,ICE,CCE,BME,CIVIL,MECH,MCTR								

Prerequisite	Fundamental knowledge in Computing Technologies	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Build distributed data processing applications using Apache Hadoop and Spark	**K3**
	CO2 Develop a streaming application using Apache Spark in teams	**K3**
	CO3 Experiment with Apache Kafka for processing stream data	**K3**
	CO4 Big Data Frameworks in teams applying best practice	**K3**
	CO5 Integrating Machine Learning Integration and Data Security	**K2**

Unit-I	INTRODUCTION TO BIG DATA TECHNOLOGOY	Periods:09
Introduction – Understanding Big Data – Big Data: Benefiting – Managing – Organizing and Analyzing Big Data: Learning and Analytics; Technology Challenges for Big Data- Distributed File System – HDFS Design Goals – MapReduce Overview – Writing and Testing MapReduce Programs – Installing Spark and Setting up Spark Cluster – Spark Shell-Creating Spark Session Object – Resilient Distributed Datasets (RDD) – Manipulating RDD – NoSQL – SparkSQL – GraphX.		**CO1**

Unit-II	STREAM PROCESSING	Periods:09
Stream Processing Concepts – Distributed Stream Processing – Stream Processing Model – Streaming Architecture – Lamda and Kappa Architecture – Structured streaming – Spark Streaming – Spark Streaming Programming Model – Other Distributed Real Time Stream Processing Systems		**CO2**

Unit-III	STREAMING PROCESSING USING KAFKA	Periods:09
Apache Kafka – Ins talling Kafka – Producers and Consumers – Kafka Internals – Building Data Pipelines – Cross Cluster Data Mirroring – Administering and Monitoring Kafka – Getting started with Kafka Streams – Kafka Streams Development – Applications with Kafka Streams		**CO3**

Unit-IV	BIG DATA FRAMEWORKS	Periods:09
Apache Flume – Overview and Architecture – Quick Start Guide to Flume – Basics of Sqoop Integrating Sqoop with Hadoop – Getting to Grips with Zookeeper – Getting Started with Zookeeper API – Machine Learning using Apache Mahout – Clustering & Classification Algorithms in Mahout-Extending Spark with H2O – H2O..		**CO4**

Unit-V	MACHINE LEARNING INTEGRATION AND SECURITY	Periods:09
Machine learning algorithms in autonomous system – MLlib in Apache Spark for distributed machine learning – Challenges and opportunities in deploying ML models in autonomy –Security considerations for autonomous data –Ethical implications in handling large datasets in autonomous engineering		**CO5**

LecturePeriods:45	TutorialPeriods:	PracticalPeriods:-	TotalPeriods:45

TextBooks

1. Neha Narkhede, Gwen Shapira, and Todd Palino, "Kafka – Definitive Guide", 2017.
2. Krishna Sankar, "Fast Data Processing using Spark 2", 3rd Edition, Packt Publishers, 2016.
3. Mike Frampton, "Mastering Apache Spark", Packt Publishers, 2015.

ReferenceBooks

1. Gerald Maas, Francois Gorillot, "Stream Processing with Apache Spark", O'Reilly Media, 2019.
2. William P Bejeck Jr, "Kafka Streams in Action", Manning Publications, 2018.
3. Jayani Withanawasam, "Apache Mahout Essentials", Packt Publishers, 2015.
4. Steve Hoffman, "Apache Flume: Distributed Log Collection for Hadoop", 2nd Edition, Packt Publishers, 2015.
5. Flavio Junqueira, Benjamin Reed, "ZooKeeper: Distributed Process Co-ordination Pa- perback", O'Reilly Media, 2014.
6. Gaurav Vaish, "Getting Started with NoSQL", Packt Publishing Ltd, 2013.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	-	-	-	-	-	-	-	-	3	3	3
2	3	3	2	-	-	2	-	-	-	-	-	-	3	2	1
3	3	3	2	2	2	3	3	-	-	-	-	-	3	2	2
4	3	2	1	2	2	3	-	-	-	-	-	-	3	1	1
5	3	2	1	2	2	3	-	-	-	-	-	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Annexure III

B.Tech. (Honors) - Advanced Web Development

Course Syllabus

(IV-VII Semester)

Honours Programme

Advanced Web Development

COURSE DETAILS											
Sl. No.	Sem	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
					L	T	P		CAM	ESM	Total
Theory											
1	IV	U23WXT401	Front-End Development	PC	3	0	0	3	25	75	100
2	V	U23WXB501	Advanced Databases	PC	3	0	2	4	50	50	100
3	VI	U23WXB602	Microservices and Spring Boot	PC	3	0	2	4	50	50	100
4	VII	U23WXT702	Container Orchestration and Security	PC	3	0	0	3	25	75	100
5	VIII	U23WXT803	Cloud Management	PC	3	0	0	3	25	75	100
6	VIII	U23WXW801	Project Phase	PW	0	0	4	2	50	50	100
	Total							**19**	**225**	**375**	**600**
Equivalent NPTEL courses[##]											
1	IV to VII Semester	U23WXNX01	Web Development Equivalent NPTEL Courses					**3**	**12 WEEK Course**		

Department	Information Technology	Name of the Programme: B.Tech. (Honors) - Advanced Web Development						
Semester	IV	Course Category Code: PC				*End Semester Exam Type: TE		
Course Code	U23WXT401	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Front-End Development	3	0	0	3	25	75	100

Prerequisite	Basic knowledge of programming concepts, HTML, and CSS.	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the fundamentals of HTML and CSS and their role in web development.	K2
	CO2 Understand the principles of responsive design and learn to use Bootstrap for creating responsive web pages.	K2
	CO3 Implement database operations using DML and DDL commands in a relational database.	K3
	CO4 Understand the basics of Node.js and learn to build server-side applications that connect to a database.	K2
	CO5 Build an Event Management System	K3

Unit- I	**HTML and CSS**	**Periods: 09**
Introduction to Web Development - HTML Basics - CSS Basics - Advanced HTML and CSS - Hands-on Projects: Building a static web page, Creating a responsive portfolio site.		**CO1**
Unit- II	**Bootstrap and Database Commands**	**Periods: 09**
Introduction to Bootstrap - Advanced Bootstrap - Database Fundamentals - Database Commands (DDL, DML) - Hands-on Projects: Building a web page with Bootstrap, Basic CRUD operations in a database.		**CO2**
Unit- III	**Connecting Database using Node js**	**Periods: 09**
Introduction to Node.js - Node.js Basics - Building a Server with Node.js - Database Integration - Hands-on Projects: Building a RESTful API with Node.js, Connecting the API to a database.		**CO3**
Unit- IV	**Connecting Database using Angular js**	**Periods: 09**
Introduction to Angular.js - Angular.js Basics - Advanced Angular.js - Database Integration - Hands-on Projects: Building a dynamic web application with Angular.js, Integrating the web app with a database.		**CO4**
Unit- V	**Case Study: Event Management System**	**Periods: 09**
Project Planning - Frontend Development - Backend Development - Database Integration - Project Implementation - Deployment - Project Documentation.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. "Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js", Shama Hoque, 2nd Edition, Packt Publishing, 2020.
2. "Node.js, MongoDB, and Angular Web Development", Brad Dayley, Brendan Dayley, and Caleb Dayley, 2nd Edition, Addison-Wesley Professional, 2018.
3. "HTML and CSS: Design and Build Websites", Jon Duckett, 1st Edition, Wiley, 2011.

Reference Books

1. "Learning SQL: Generate, Manipulate, and Retrieve Data", Alan Beaulieu, 3rd Edition, O'Reilly Media, 2020.
2. "Pro Angular 9: Build Powerful and Dynamic Web Apps", Adam Freeman, 4th Edition, Apress, 2020.
3. "You Don't Know JS Yet: Get Started", Kyle Simpson, 2nd Edition, 2020.
4. "Web Development with Node and Express: Leveraging the JavaScript Stack", Ethan Brown, 2nd Edition, O'Reilly Media, 2019.
5. "Eloquent JavaScript: A Modern Introduction to Programming", Marijn Haverbeke, 3rd Edition, No Starch Press, 2018.

Web References

1. https://developer.mozilla.org/en-US/docs/Web/HTML
2. https://developer.mozilla.org/en-US/docs/Web/CSS
3. https://getbootstrap.com/docs/
4. https://nodejs.org/en/docs/
5. https://angular.io/docs

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	2	1	-	1	-	2	2	2	3	2	2
2	2	3	3	3	2	1	-	1	-	2	2	2	3	2	2
3	3	3	3	3	3	2	-	2	-	2	2	2	3	2	2
4	3	3	3	3	3	2	-	2	-	2	2	2	3	2	2
5	3	3	3	3	3	2	-	2	2	2	2	2	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Department	Information Technology	Name of the Programme: **B.Tech. (Honors) - Advanced Web Development**						
Semester	V	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	U23WXB501	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Advanced Databases**	**3**	**0**	**2**	**4**	**50**	**50**	**100**

Prerequisite	Database Management Systems	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Illustrate parallel and distributed databases to optimize database performance in practice.	**K2**
	CO2 Examine data on Active, spatial and temporal databases	**K3**
	CO3 Develop cloud-based and multimedia based applications.	**K3**
	CO4 Demonstrate hands-on proficiency in MongoDB, including installation, CRUD operations, and advanced query operations.	**K3**
	CO5 Implement advanced data models, replication, and sharding in MongoDB.	**K3**

Unit-I	**Parallel and Distributed DBMS**	**Periods:10**
Parallel DBMS: Architecture Query evaluation - Query optimization Parallelizing individual operations. Distributed DBMS: Architecture - Storing - Data Cataloguing - Query processing - Updations - Transactions Concurrency and Recovery.		**CO1**
Unit-II	**Active, Temporal, Spatial Databases**	**Periods:10**
Active Databases: Syntax and Semantics (Starburst, Oracle, DB2) - Taxonomy - Applications - Design Principles for Active Rules. Temporal Databases: Overview of Temporal Databases - TSQL2 Spatial Databases - Spatial Data Types - Spatial Relationships - Spatial Data Structures - Spatial Access Methods - Spatial DB Implementation.		**CO2**
Unit-III	**Cloud Based Databases and Emerging Technologies**	**Periods:10**
Data Storage Systems on the Cloud - Cloud Storage Architectures - Cloud Data Models - Query Languages - Introduction to Big Data - Storage – Analysis Mobile Databases - Multimedia Databases - Geographical Information Systems - Genome Data Management.		**CO3**
Unit-IV	**MongoDB Installation and CRUD Operations**	**Periods:15**
1. Setting Up MongoDB Environment 2. Creating collections 3. CRUD operations 4. Schema Design: Embedding vs. Referencing, Indexing, Aggregation framework 5. Query Operations: Filtering, Sorting, Aggregation, Transactions in MongoDB. 6. Data Processing: MapReduce concepts, Processing JSON data, Integrating MongoDB with applications.		**CO4**
Unit- V	**Advanced Data Model and Cloud Databases**	**Periods:15**
1. Replication and Sharding: Concepts, Implementing replication, Setting up sharded clusters. 2. MongoDB and Cloud Integration: Deploying databases on cloud platforms (AWS) 3. MongoDB and Cloud Integration: Deploying databases on cloud platforms (Azure) 4. Real-time Case Study: Implementing a real-world project using MongoDB (E-commerce). 5. Real-time Case Study: Implementing a real-world project using MongoDB (IoT) 6. Real-time Case Study: Implementing a real-world project using MongoDB (Social Media Data)		**CO5**

LecturePeriods:30	**Tutorial Periods:-**	**Practical Periods:30**	**Total Periods:60**

Text Books

1. Thomas M. Connolly, Carolyn Begg, Database Systems: practical approach to design, implementation, and management, Pearson Education Limited, Sixth Edition, 2019
2. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, MongoDB: The Definitive Guide: Powerful and Scalable Data Storage, Third Edition, O'Reilly Media, 2019.

Reference Books

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, - Database System Concepts, Seventh Edition, McGraw Hill, 2019.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, Advanced Database Systems, Morgan Kaufmann publishers,2006.
3. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, Third Edition., McGraw Hill Publications, 2018

Web References

1. http://www.exploredatabase.com/p/blog-page.html
2. http://csce.uark.edu/~cwt/COURSES/2014-01--CSCE-4543--SW-ARCH/03--CHAPTERS/Chapter09--Spatial and Temporal DBMS Extensions--Namburi.pdf
3. https://www.tutorialspoint.com/Mobile-Databases
4. https://www.mongodb.com/docs/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	2	1	-	1	-	2	2	2	3	2	2
2	2	3	3	3	2	1	-	1	-	2	2	2	3	2	2
3	3	3	3	3	3	2	-	2	-	2	2	2	3	2	2
4	3	3	3	3	3	3	-	3	-	3	3	2	3	2	2
5	3	3	3	3	3	2	-	3	2	3	3	2	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Department	Information Technology	Name of the Programme: **B.Tech. (Honors) - Advanced Web Development**						
Semester	VI	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	U23WXB602	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Microservices and Spring Boot**	**3**	**0**	**2**	**4**	**50**	**50**	**100**

Prerequisite	Basic understanding of Java, web technologies, Spring Framework, relational databases, Git, and IDEs	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand microservices architecture and develop a basic Spring Boot microservice.	**K2**
	CO2 Manage configuration, apply dependency injection, and use Spring Boot Actuator.	**K2**
	CO3 Implement service discovery, inter-service communication, and containerization	**K3**
	CO4 Develop Spring Boot Applications with Dependency Injection and CRUD operations	**K3**
	CO5 Develop and deploy Spring Boot Applications with Docker and Kubernetes	**K3**

Unit- I	**Microservices and Spring Boot**	**Periods: 10**
Microservices: Definition, core principles, advantages, and challenges, Monolithic vs. Microservices. **Spring Boot:** Spring Framework **Basics** - Key features and benefits - Building a simple Spring Boot application using Maven - Running and testing microservice		**CO1**
Unit- II	**Spring Boot Features and Building**	**Periods: 10**
Configuration Management: Properties and application.yml - Using Spring profiles for environment. **Dependency Injection:** Understanding Dependency Injection (DI) - Configuring beans and component scanning - @Autowired and Spring annotations. **Spring Boot Actuator:** Introduction, key endpoints (/health, /metrics, /info), customizing Actuator endpoints		**CO2**
Unit- III	**Discovery, Data Management and Containerization**	**Periods: 10**
Service Discovery with Eureka: Setting up a Eureka server and Client. **Inter-Service Communication:** RESTful web services with Spring Boot - Using Rest Template and Web Client. **Spring Data JPA:** Spring Data JPA - JPA repositories – Basic CRUD operations. **Containerization:** Docker basics, Creating and Running Docker images for Spring Boot apps. **Kubernetes:** Deploying microservices to Kubernetes, Service Management		**CO3**
Unit- IV	**Laboratory Exercises**	**Periods: 15**
1. Set up a Spring Boot development environment 2. Create a simple "Hello World" REST API using @RestController 3. Implement DI using @Component, @Service, and @Repository 4. Implement CRUD operations using @PostMapping annotation and @GetMapping annotation with NoSQL 5. Implement CRUD operations using @PutMapping annotation and @DeleteMapping annotation with MongoDB 6. Implement basic CRUD operations on MongoDB with Spring Data JPA		**CO4**
Unit- IV	**Laboratory Exercises**	**Periods: 15**
1. Implement Eureka Server for service discovery 2. Register a microservice with Eureka Client 3. Implement inter-service communication using RestTemplate 4. Containerize a Spring Boot app using Docker and deploy it locally 5. Deploy microservices to Kubernetes using Minikube 6. Develop and deploy a mini microservices-based application (E-commerce, Inventory)		**CO5**

Lecture Periods: 30	**Tutorial Periods:**	**Practical Periods: 3 0**	**Total Periods: 60**

Text Books

1. Microservices with Spring Boot and Spring Cloud: Build Resilient and Scalable Microservices Using Spring Cloud, Istio, and Kubernetes, 2nd Edition, 2020
2. Title: "Microservices Architecture: Aligning Principles, Practices, and Culture", Author: Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, and Mike Amundsen, 2019
3. Title: "Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy Java microservices using Spring Cloud, Istio, and Kubernetes", Author: Magnus Larsson, 2019

Reference Books

1. "Spring Microservices in Action" by John Carnell
2. "Building Microservices" by Sam Newman
3. "Microservices Patterns: With examples in Java" by Chris Richardson
4. "Spring Boot in Action" by Craig Walls
5. "Cloud Native Java: Designing Resilient Systems with Spring Boot, Spring Cloud, and Cloud Foundry" by Josh Long and Kenny Bastani

Web References

1. https://docs.spring.io/spring-boot/index.html
2. https://www.baeldung.com/
3. https://www.javaguides.net/p/spring-boot-microservices-tutorial.html
4. https://www.javatpoint.com/microservices
5. https://www.geeksforgeeks.org/java-spring-boot-microservices-example-step-by-step-guide/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	2	1	-	1	2	-	2	2	3	2	2
2	2	3	3	3	2	1	-	1	2	-	2	2	3	2	2
3	3	3	3	3	3	2	-	2	3	-	3	3	3	2	2
4	3	3	3	3	3	2	-	2	3	3	3	3	3	2	2
5	3	3	3	3	3	2	-	2	3	3	3	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Department	Information Technology	Name of the Programme: **B.Tech. (Honors) - Advanced Web Development**						
Semester	VII	Course Category Code :**PC**			End Semester Exam Type: **TE**			
Course Code	U23WXT702	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Container Orchestration and Security**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Computer Networks	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the basics of Container Orchestration and Security	**K2**
	CO2 Identify Kubernetes architecture and integrating Kubernetes with CI/CD	**K2**
	CO3 Overview of Orchestration with Docker Swarm and Other Tools	**K3**
	CO4 Identify Security principles, encompassing authentication, authorization (RBAC).	**K3**
	CO5 Understand the secure CI/CD integration with containers, utilizing tools	**K2**

UNIT-I	**Introduction to Container Orchestration and Security**	**Periods:09**
Introduction to Docker - Server virtualization - Advantages of Docker - Docker Setup - Limitations in Docker - Convergence of containerization and virtualization - Containerization innovations		**CO1**
UNIT-II	**Kubernetes Concepts**	**Periods:09**
Kubernetes Architecture - Overview of Kubernetes architecture - Integrating Kubernetes with CI/CD pipelines - Pod Lifecycle and Management - Pod states and transitions - Multi-container Pod patterns		**CO2**
UNIT-III	**Container Orchestration with Docker Swarm and Other Tools**	**Periods:09**
Docker Swarm Fundamentals - Overview of Docker Swarm - Setting up a Docker Swarm cluster - Comparison with Other Orchestration Tools - Docker Swarm vs. Kubernetes - Overview of Apache Mesos		**CO3**
UNIT-IV	**Kubernetes Security**	**Periods:09**
Kubernetes Security - Authentication and authorization in Kubernetes (RBAC) - Pod Security Policies and Network Policies- Securing: Kubernetes Data Store Security - Container Security - Securing container images and runtimes - Managing secrets and sensitive data in Kubernetes		**CO4**
UNIT-V	**Securing and Monitoring Containerized Environments**	**Periods:09**
CI/CD Integration - Continuous integration and continuous deployment with containers - CI/CD tools: Jenkins, GitLab CI, Tekton - Automating deployments with Kubernetes and Docker - Use cases and scenarios for different Orchestration tools		**CO5**

LecturePeriods:45	**TutorialPeriods:-**	**PracticalPeriods:-**	**TotalPeriods:45**

Text Books

1. Up and Running by Brendan Burns, Joe Beda, Kuan-Wei Chiu, et al. , 2nd edition, O'Reilly Media, 2019
2. **The Kubernetes Book, Nigel Poulton & Pushkar Joglekar , Self-published, 2018**
3. Kubernetes Security, Liz Rice, Michael Hausenblas , O'Reilly Media , 2018

Reference Books

1. Mastering Kubernetes, Gigi Sayfan, Packt Publishing ,2020
2. Learning Helm: Managing Apps on Kubernetes, Matt Butcher, Matt Farina, Josh Dolitsky, O'Reilly Media , 2021
3. Kubernetes security. Guide for beginners from zero to hero, Ivan Piskunov, Self-published, 2021.
4. Production Kubernetes , Josh Rosso, Rich Lander, Alex Brand, John Harris, O'Reilly Media, Inc. 2021
5. Docker Orchestration, Randall Smith, Packt Publishing, 2017

Web References

1. https://www.cb-india.com/books/operating-systems/unix-and-linux/book-of-kubernetes/
2. https://www.oreilly.com/library/view/python-for-devops/9781492057680/ch12.html
3. https://www.powells.com/book/-9781718502642/1-0
4. https://dl.acm.org/doi/10.5555/3265145
5. https://malaysia.kinokuniya.com/The_Book_of_Kubernetes_:_A_Complete_Guide_to_Container_Orchestration/bw/9781718502642

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	2	1	-	1	-	1	1	2	3	2	2
2	2	3	3	3	2	1	-	1	-	1	1	2	3	2	2
3	3	3	3	3	3	2	-	2	-	1	2	2	3	2	2
4	3	3	3	3	3	3	-	3	-	1	2	2	3	2	2
5	3	3	3	3	3	2	-	3	2	1	2	2	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Annexure IV

B.Tech. (Honors) - Advanced Web Development

Registered Students Namelist

Details of Students Registered for Honors Degree – Advanced Web Development

Sl. No.	Enroll No.	Register No.	Name of the Student
1	230843	23UIT010	ANUSHA.R
2	231198	23UIT018	BAVADHARANI.R
3	230753	23UIT019	BHARATH KUMAR.M
4	230678	23UIT020	BHUVANESH.S
5	230297	23UIT023	DARSHAN.D
6	231511	23UIT028	DOMMETI PRAVEEN SATYA PRAKASH
7	231021	23UIT032	GOBIGA K
8	231571	23UIT034	GOWTHAM K
9	231268	23UIT036	GUNAL.S
10	231272	23UIT050	HONNESHAA JAIN
11	230110	23UIT053	JAMUNA E
12	230061	23UIT056	JERRICK AUSTIN MANUEL G
13	230324	23UIT060	KARTHIKEYAN.S
14	231210	23UIT067	LAKSHITA A
15	231204	23UIT079	LOKETHA M
16	231066	23UIT082	MEGHA K
17	230720	23UIT084	MOHANA PRIYA K
18	230900	23UIT096	POORNIMA R
19	230555	23UIT102	PRITIKA.V
20	231331	23UIT103	PRIYADHARSHINI E
21	230820	23UIT104	PRIYANKA S
22	231250	23UIT110	RAKSHITA K
23	230946	23UIT111	RAM KUMAR R
24	230806	23UIT129	SARANYA V
25	231427	23UIT131	SATHISHVARAN E
26	230821	23UIT132	SATHYASRI S
27	231472	23UIT133	SAVITHA.V
28	230453	23UIT137	SENDIL BALAJI.C
29	230836	23UIT138	SHANMATHY M
30	230464	23UIT139	SHARMILAA S
31	230547	23UIT150	SUDESHNAA P
32	231498	23UIT151	SWETHA S

Details of Students Registered for Honors Degree –

Artificial Intelligence and Machine Learning

Sl. No.	Enroll No.	Register No.	Name of the Student
1	230991	23UIT025	DHANALAKSHMI.S
2	231323	23UIT031	GEETHAKOKILAM.R
3	230352	23UIT042	HARINI.D
4	230408	23UIT054	JANANI MURUGESAN
5	230906	23UIT075	LOKESH.S
6	230975	23UIT085	MUHAMMAD SUHAIL.A
7	230376	23UIT086	MUKESH S
8	230930	23UIT120	SABARISH S
9	230256	23UIT140	SHIFA.A