Shivaji University
Vidya Nagar, Kolhapur, Maharashtra

Department of Technology

B. Tech. Part-IV
(Computer Science and Technology)
Curriculum Structure
w. e. f. 2026-27 onwards

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (Computer Science and Technology), Semester- VII

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Program Core Course	PCC411	High Performance Computing	03	-	-	03	03	30:70	00:00
2.	Program Core Course	PCC412	Soft Computing	03	-	02	05	04	30:70	50:00
3.	Program Core Course	PCC413	Advanced Database Management System	03	-	-	03	03	30:70	00:00
4.	Program Elective Course	PEC 411	Elective II	03	-	-	03	03	30:70	00:00
5.	Open Elective Course	OEC 411	Open Elective- II	03	-	-	03	03	30:70	00:00
6.	Program Core Course	PCC414	Web Technology Lab	-	-	02	02	01	00:00	50:50
7.	Project Based Learning	PBL411	Major Project-I	-	-	04	04	02	00:00	50:50
8.	Value Education Course	VEC411	Green Technology & Sustainability	01	-	-	01	01	-	50:00
9.	Project Seminar Internship	PSI 412	MDM based Industry Internship *	One Month Duration*				03	-	50:50
							-	**23**	**500**	**400**
			Total Hours	**16**	**00**	**08**	**24**	**-**	**-**	**-**

* **The MDM based industry Internship to be completed during any winter/summer vacation slots 4th Semester onwards, before 7th Semester commencement.**

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (Computer Science and Technology), Semester- VIII

Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Project Seminar Internship	PSI 421	Industrial Internship (Follow up by the Department)	Entire Semester to be spent in industry				10	00:00	150:100
2.	Program Elective Course [SWAYAM (NPTEL) or any other MOOCs]	PEC 421	Program Elective –III Through MOOC*	03	-	-	03	03	30:70	00:00
3.		PEC 422	Program Elective –IV Through MOOC*	03	-	-	03	03	30:70	00:00
4.	Indian Knowledge Systems	IKS 421	Program Specific IKS	02	-	-	02	02	30:70	00:00
5.	Project Seminar Internship	PSI 424	Major Project-II	-	-	02	02	01	00:00	100:100
6.	Value Education Courses	VEC 421	Professional Ethics (Through MOOC)	01	-	-	01	01	-	50:00
7.	Project Based Learning	PBL 421	MDM based Mini Project**	-	-	-	-	02	-	50:50
				-	**-**	**-**	**-**	**22**	**300**	**600**
			Total Hours (Other than Internship)	**09**	**00**	**02**	**11**	**-**	**-**	**-**

*There is an option for End Semester Examination either on respective MOOC platform or at the course teacher's end through the University System.

** MDM based Mini Project to be completed during 4th Semester to 8th Semester.

Year, Program, Semester	Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII				
Course Code	PCC411				
Course Category	Core Subject				
Course title	High Performance Computing				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	03	-	-	03	03
Evaluation Scheme	ISE	ESE	IE	EE	Total
	30	70	-	-	100
Pre-requisites(if any)	Computer Organization, Operating System				
Course Objectives	**The Course is aimed to-** 1. Provide detail knowledge of different Parallel Architectures 2. Analyze performance measures for evaluation of parallel architectures and pipeline processors 3. Provide details of multitasking architecture and Latency hiding techniques 4. Provide details of processor topology and multiprogramming architectures 5. Provide details of data flow architecture and data flow programming language 6. Analyze modes of programming parallel architectures				
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Classify parallel architectures 2. Analyze and evaluate parallel architectures and describe pipelined processors. 3. Understand concept of multitasking architecture and Latency hiding techniques 4. Design processor topology and understand basics multiprogramming architectures 5. Understand data flow architecture and data flow programming language 6. Analyze and understand modes of programming parallel architectures				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	-													
CO 2	3	1	1	1											
CO 3	3	1													
CO 4	2		1		1								1		
CO 5	2			1											
CO6	2	2		2	2										

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction** Architectures and its classification, Evolution of parallel processors, current & future trends towards parallel processors. Principles of pipelining and array processing. Scalar and vector pipelines. Architectural development tracks.	7
II	**Pipeline Processors** Classification of pipelined processors, Instruction Pipeline design, performance evaluation factors. Vector processing concepts, pipelined vector processors, Cray type vector processor -design example. Array processors	7
III	**Multithreading** Introduction to Associative memory processors, examples – STARAN. Multithreaded arch – principles of multithreading, Scalable and multithreaded architectures Latency hiding techniques. Scalable coherent multiprocessor model with distributed shared memory	6
IV	**Multiprocessing** Various topologies, static and dynamic type of networks with examples. Loosely coupled and tightly coupled architectures. Cluster computing as an application of loosely coupled architecture. Example –CM*	6
V	**Data Flow Architectures** Dataflow Architectures: Concepts of data flow computing, static and dynamic dataflow architectures. Dataflow operators, data flow language properties, advantages & potential problems	6
VI	**Parallel Programming** Parallel programming models, parallel languages and compilers, code optimization and scheduling, loop parallelization and pipelining.	7
Text Books		
1.	Advanced computer architecture – Kai Hwang (MGH)	
2.	Computer Architecture and Parallel Processing – Kai Hwang and Briggs (MGH).	
3.	Advanced Computer Architectures ,Parallelism, Scalability, Programmability, Kai Hwang & Naresh Jotwani, 2nd Edition McGrawHill Education.	
Reference Books		
i)	Parallel and Distributed Systems 2nd Edition Arun Kulkarni, Napur Prasad Giri, Wiley Publications	

Year, Program, Semester	**Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII**					
Course Code	**PCC412**					
Course Category	**Core Subject**					
Course title	**Soft Computing**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	03	**-**	**02**	**05**		**04**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	30		**70**	**50**	**-**	**150**
Pre-requisites(if any)	Mathematics (Calculus & Linear Algebra), Discrete Mathematics, C, C++, Java					
Course Objectives	**The Course is aimed to-** 1. Familiarize the students with soft computing concepts. 2. Conceptualize the working of the human brain using ANN. 3. Make students familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems. 4. Introduce the ideas of fuzzy sets, fuzzy logic, and the use of heuristics based on human experience 5. Provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global optimum in self-learning situations. 6. Introduce the applications of soft computing					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Understand different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks, and their combination. 2. Design and implement computing systems by using appropriate Artificial Neural networks and tools. 3. Apply neural networks to pattern classification 4. Apply the concepts of Fuzzy Logic, Various fuzzy systems, and their functions to real-time systems. 5. Analyze the genetic algorithms and their applications to solve engineering optimization problems 6. Apply soft computing techniques to solve engineering or real-life problems.					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	2	3	0	0	0	0	0	0	0	0	0	2
CO 2	2	2	3	2	3	0	0	0	0	0	0	0	0	0	2
CO 3	2	2	2	2	3	0	0	0	0	0	0	0	0	0	2
CO 4	2	2	2	2	2	0	0	0	0	0	0	0	0	0	3
CO 5	2	2	3	2	3	0	0	0	0	0	0	0	0	0	3
CO 6	2	2	3	2	3	0	0	0	0	0	0	0	0	0	2

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction:** Artificial Neural Network, Advantages of Neural Network, Fuzzy Logic, Genetic Algorithms, Hybrid Systems: Neuro-Fuzzy Hybrid System, Neuro-Genetic Hybrid System, Fuzzy-Genetic Hybrid System.	5
II	**Artificial Neural Networks:** Fundamental Concept, Evolution Of Neural Networks, Basic Models of Artificial Neural Network, Terminologies of ANNs, McCulloch-Pitts Neuron, Linear Separability, Hebb Network.	7
III	**Supervised Learning Network:** Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neuron, Back Propagation Network, Radial Basis Function Network.	7
IV	**Introduction to Fuzzy Sets:** Introduction, Classical Sets, Fuzzy Sets, Fuzzy relations, Membership Function, Defuzzification, Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Rule base and Approximate Reasoning, Fuzzy Decision Making, Fuzzy Logic Control System.	7
V	**Genetic Algorithms:** Introduction, Basic Operators and Terminologies in GAs , Traditional Algorithm vs Genetic Algorithms, Simple GA, General Genetic Algorithm, The Schema Theorem, Classification of Genetic Algorithm, Holland Classifier System, Genetic Programming, Applications of GA.	7
VI	**Applications of Soft Computing:** GA Based Internet Search Technique; Soft Computing Based Hybrid Fuzzy Controllers.	5

List of Experiments	
Sr. No.	
1.	Write a program to implement logical AND using McCulloch Pitts neuron model
2.	Write a program to implement logical XOR using McCulloch Pitts neuron model
3.	Write a program to implement logical AND using the Perceptron network
4.	Write a program to implement logical OR using the Perceptron network
5.	Write a program to implement logical AND using the Adaline network
6.	Write a program to implement logical OR using the Adaline network
7.	Write a program to implement logical XOR using the Madaline network

8.	Write a program to implement a Backpropagation network
9.	Write a program to implement the various primitive operations of classical sets
10.	Write a program to implement various primitive operations on fuzzy sets with Dynamic Components.
11.	Write a program to maximize $f(x_1+x_2)=4x_1+3x_2$ using a genetic algorithm
12.	Write a program to minimize $f(x)=x^2$ using a genetic algorithm

Text Books	
i)	S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing (Wiley India Edition).
ii)	K. Mehrotra, C.K. Mohan, and S. Ranka, Elements of Artificial Neural Networks, Published by MIT Press, 1997 (http://mitpress.mit.edu/book-home.tcl?isbn=0262133288)
Reference Books	
i)	F.O. Karray & C.D. Silva, Soft Computing and Intelligent Systems Design – theory, tools and applications – (Pearson Education).
ii)	J.S.R. Jang, C.T. Sun & E. Mizutani, Neuro-Fuzzy and Soft Computing – A computational approach to learning and machine intelligence – (Pearson Education).

<table>
<tr><td>Year, Program, Semester</td><td colspan="6">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII</td></tr>
<tr><td>Course Code</td><td colspan="6">PCC413</td></tr>
<tr><td>Course Category</td><td colspan="6">Core Subject</td></tr>
<tr><td>Course title</td><td colspan="6">Advanced Database Management System</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td colspan="2">Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td colspan="2">03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="6">The knowledge of Database Engineering</td></tr>
<tr><td>Course Objectives</td><td colspan="6">The Course is aimed to-
1. Discuss the different types of database system architectures.
2. Help Students to Design and implement advanced object-oriented database queries using Structured Query Language.
3. Explain study and designing of distributed database with its applications.
4. Elaborate parallel database principles.
5. Describe recommending and implementing procedures including database tuning, backup, query processing, query optimization and recovery.
6. Teach advanced querying with Decision support system and information retrieval.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">Upon completion of this course, student should be able to –
1. Explain and evaluate the fundamental theories for advanced database architectures and query operators.
2. Design and implement parallel database systems with evaluating different methods of storing, managing of parallel database.
3. Assess and apply database functions of distributed database.
4. Evaluate different database designs and architecture.
5. Administer and analyses database with query optimization techniques and develop Web interface with database.
6. Understand advanced querying and decision support system.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2		2								1			
CO 2	3	3	3	2	2										
CO 3	3	3	2	2	2										
CO 4	2	3	2	2											
CO 5	2	3	3	2	3						2				
CO6	2	3	2	2	2							3			

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Database Systems architectures** Centralized & C/S architectures, server systems, distributed systems, networks types. **Object-Relational Databases** Nested relations, complex types, inheritances, reference types, querying with complex types, functions and procedures, OO versus Object-Relational.	4 5
II	**Distributed Databases** Homogeneous & heterogeneous databases, distributed data storage, distributed transactions, commit protocols, concurrency control in distributed databases, availability, distributed query processing, heterogeneous distributed databases, directory systems.	6
III	**Parallel Database** Integrated, I/O parallelism, inter-query parallelism, intra-query parallelism, intra-operation parallelism, inter-operation parallelism, design of parallel systems.	5
IV	**Application Development & Administration** Web interfaces to databases, performance tuning, performance benchmarks, standardization, E-commerce, Legacy systems.	7
V	**Advanced Querying & Information Retrieval** Decision support systems, data analysis and OLAP, Data mining, data-warehousing, Information Retrieval systems.	7
VI	**Advanced Transaction Processing** Transaction-processing monitors, transactional workflows, main-memory databases, real-time transaction systems, long-duration transactions, transaction management in multi-databases.	5
Text Books		
i)	Silberschatz, Korth, Sudarshan – 4th Edition Database system concepts – (MGH).	
ii)	Raghu Ramkrishnan Database Management System – (MGH).	
Reference Books		
i)	Thomas Connolly & Carolyn Begg (Pearson) Third Edition Database Systems: A practical approach to design, implementation & Management.	
ii)	Ramez Elmasri and Shamkant Navathe, Fundamentals of Database Systems 2nd Ed, Benjamin Cummings, 1994.	

Year, Program, Semester	**Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII**				
Course Code	**PEC411**				
Course Category	**Program Elective Course**				
Course title	**Elective –II :Advanced Network Engineering**				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	03	**-**	**-**	**03**	**03**
Evaluation Scheme	**ISE**	**ESE**	**IE**	**EE**	**Total**
	30	**70**	**-**	**-**	**100**
Pre-requisites(if any)	The knowledge of Basic Computer Networking				
Course Objectives	**The Course is aimed to-** 1. Introduce various networking components and Microsoft windows operating system, concepts and trends 2. Provide the knowledge of overall system architecture of windows operating system with its key system components. 3. Provide the knowledge of windows security system components and design issues of it. 4. Introduce I/O system components of windows network operating system. 5. Provide knowledge of windows networking architecture and Microsoft Azure Cloud Services. 6. Provide knowledge of Microsoft Azure Cloud Services.				
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Identify the various networking devices like switches, hub, routers, and gateways with their functioning and understand Microsoft windows O.S. Concept and terms 2. Learn overall system architecture of windows with its key components. 3. Learn security system components and analyze design issues of Window security system. 4. Understand and analyze I/O system components of Windows Network operating system. 5. Identify various programming models and protocol support for implementing windows network applications and Microsoft Azure Cloud Services. 6. Identify various services for setting and configuring Microsoft Azure Cloud etc.				

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1													
CO 2		2	3		2										
CO 3	2		2		3										
CO 4	3	2		1											
CO 5	3	2			2										
CO6	3	2													

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction to concepts and tools of Windows Operating System** Introduction to Networking Components, Architectures, Windows Flavors of Network , Operating Systems, Foundation Concepts And Terms, Windows API, Services, Functions, Routines, Processes, Threads, Jobs, Virtual Memory, Kernel Mode Vs. User , Mode, Terminal Services And Multiple Sessions, Objects And Handles, Registry**.**	4
II	**System Architecture** Requirements and Design Goals, Operating System Model, Architecture Overview, Key System Components.	5
III	**Security** Security Ratings, Security System Components, Protecting Objects, Account Rights, and Privileges, Security Auditing.	7
IV	**I / O system** Device Drivers, Types of Device Drivers, Structure of a Driver, Types of I/O, The Plug and Play (pnp) Manager, Installation. Storage terminology, disk drivers, volume management, windows file system formats, File system driver architecture.	7
V	**Windows networking architecture** Windows networking architecture, the OSI reference model, windows networking Components, networking APIs, windows sockets, Winsock kernel (wks.), remote procedure Call, web access APIs, named pipes and mail slots , NetBIOS, other Networking APIs	8
VI	**Linux Services , Protocols and Microsoft Azure cloud services** Linux Services and protocols-FTP, SMTP, Telnet IP Sec and Virtual Private Network(VPN) , Core Microsoft Azure Services	8
	Text Books	
i)	Mark E. Russinovich and David A. Solomon with Alex lonescu Windows Internals, Including Windows Server 2008 and Windows Vista 5th Edition (2009) .(MS Press)..	
	Reference Books	
i)	Charlie Russel and Craig Zacker Introducing Server 2008 R2 (Microsoft Press).	
ii)	Anthony Jones & Jim Ohlund Network Programming for MS Windows 2nd Edition – (Microsoft Corporation)	
iii)	Jonathan Hassell Windows Server 2008: The Definitive Guide (SPD O'Reilly). Jeffrey R.Shapiro Windows Server 2008 – (Wiley India Edition)	
iv)	Richard Petersen Linux: The complete Reference Sixth edition (TMGH)	

<table>
<tr><td>Year, Program, Semester</td><td colspan="6">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII</td></tr>
<tr><td>Course Code</td><td colspan="6">PEC 411</td></tr>
<tr><td>Course Category</td><td colspan="6">Program Elective Course</td></tr>
<tr><td>Course title</td><td colspan="6">Elective-II :Industrial Management</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td colspan="2">Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td colspan="2">03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="6">Basic understanding of software engineering, project management practices.</td></tr>
<tr><td>Course Objectives</td><td colspan="6">The Course is aimed at-
1. Developing an understanding of the business environment, management concepts, business ethics, and social responsibility of organizations.
2. Introducing the fundamental functions of management such as planning, organizing, staffing, directing, and controlling for effective managerial practice.
3. Enhancing the ability to apply managerial tools and techniques related to decision-making, forecasting, communication, motivation, and leadership.
4. Providing exposure to functional areas of management including marketing, finance, production, human resource, and materials management.
5. Building analytical and problem-solving skills through the study of inventory control techniques and materials management practices.
6. Encouraging entrepreneurial mindset and legal awareness by understanding entrepreneurship development, SSI, industrial laws, and intellectual property rights.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">Upon completion of this course, student should be able to –
1. Explain the business environment, ethical practices, and social responsibility of business, along with the nature and levels of management.
2. Apply the principles of planning and organizing, including decision-making, forecasting methods, organizational structures, and culture, in managerial situations.
3. Demonstrate the application of staffing, directing, motivation, leadership, communication, and controlling techniques to improve organizational performance.
4. Describe the roles and functions of marketing, finance, production, and human resource management in achieving organizational objectives.
5. Analyze materials management practices, inventory control techniques such as EOQ and ABC analysis, and purchasing procedures for cost effectiveness.
6. Evaluate entrepreneurial opportunities, challenges of SSI, and the impact of legal frameworks and intellectual property rights in business and industrial development.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1				3	2	3				1			
CO 2	2	3	2		1						3			1	
CO 3	1	2							3	3	3			3	
CO 4	2	2									3				
CO 5	2	3	2		1						3				
CO6		2					2	3			2	3		3	

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Business Environment** Introduction, factor affecting business, external environment, business ethics, social Responsibility of business. **Management:** Definition, nature, level, management environment.	4
II	**Functions of Management** **Planning**: Need, Nature, Types, Steps, Decision making, Forecasting methods. **Organizing**: Importance, process, principles, types: Functional product matrix network, organizational culture	5
III	**Staffing**: Nature and purpose, recruitment polices and selection procedure. Induction and performance appraisal. **Directing:** a) **Business Communication:** Importance, process, types, barriers and remedies, key communication skills. b) **Motivation:** Components, Applications of motivation, Participative management. c) **Leadership:** Meaning, leadership style, working with teams. **Controlling:** Requirement of controlling, basic process, control technique, Budgetary control.	9
IV	**Introduction to functional areas as** **Marketing Management:** Concept, Objectives, market segmentation, marketing mix, market research, Advertising: need, objective advantages and types. **Financial Management:** Sources of finance, capital types, financial institution, financial statements balance sheet, Profit & Loss A/C (contents only). **Production Management:** Selection of site, plant layout, objectives principles, merit and demerit of each type, function of P.P.C., maintenance management. **Human Resource Management:** Functions of H.R.M., Industrial relation, training and development, wage administration and incentives plans.	10
V	**Materials Management** Scope, function, purchasing objectives, 5-R principles, purchasing policies and procedure, vendor development, Inventory management. EOQ, ABC and related analysis.	5
VI	**Entrepreneurship Development Program:** Concept of entrepreneur, Qualities required, factors promoting entrepreneurship, Reasons for entrepreneurship failure, Entrepreneurship development. **S.S.I.:** Definition of SSI, Procedure to start SS unit. Institution offering assistance to SSI, problems of SSI. **Legal Aspects:** Factory act, consumer protection act, industrial safety act, cyber law. Intellectual property right: patent need advantage, procedure.	6
Text Books		
i)	Koontz O'Donell, *"Essentials of Management",* Tata McGraw Hill Publication.	

ii)	O.P. Khanna, *"Industrial Engineering and Management",* Prentice Hall of India Pvt. Ltd.
iii)	Bunga Sharma *"Organizational Management".*
iv)	B. K. Chatterjee *"Finance for Non-Financial Managers".*
v)	Bose Talukdar *"Business Management".*
vi)	Raghu Ramkrishnan Database Management System – (MGH).
Reference Books	
i)	Stoner, *"Management",* Prentice Hall of India Pvt. Ltd.
ii)	Philip Kotler, *"Marketing Management",* Prentice Hall of India Pvt. Ltd.
iii)	Telsung, S *"Industrial Management",* Chand Publication.
iv)	Ashwathappa, *"Human Resource Management",* Tata McGraw Gill Publishing Co.
v)	P. Subbarrao*,"Essentials of Human Resources Management and Industrial Relation",* Himalaya publication.

Year, Program, Semester	**Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII**					
Course Code	**PEC 411**					
Course Category	**Program Elective Course**					
Course title	**Elective-II : Information Security**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	03	**-**	**-**	**03**		**03**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	30		**70**	**-**	**-**	**100**
Pre-requisites(if any)	Computer algorithm, Applied Mathematics					
Course Objectives	**The Course is aimed to-** 1. Provide knowledge of basics of cryptography, and some key encryption techniques. 2. Explain modern cryptosystems. 3. Discuss concepts of finite mathematics and number theory and concepts of public key cryptography 4. Discuss security policies such as authentication, integrity and confidentiality. 5. Provide Knowledge key management and key distribution 6. Discuss network and Web security protocols.					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Describe basic terminology in cryptography, and classical cryptosystems. 2. Discuss and use modern cryptosystems. 3. Apply concepts of finite mathematics and number theory and concepts of public key cryptography 4. Discuss and Apply security policies such as authentication, integrity and confidentiality. 5. Apply key management and key distribution 6. Analyze and use network and Web security protocols.					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	**3**	**2**	**1**												
CO 2	**3**	**2**	**2**	**2**	**2**								**1**		
CO 3	**3**	**2**	**2**	**3**	**3**								**2**		
CO 4	**2**	**2**	**2**	**2**	**2**								**2**		
CO 5	**2**	**2**	**2**	**2**	**3**								**2**		
CO6	**0**	**2**	**2**	**2**	**3**								**2**		

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Overview and Classical Encryption Techniques** Overview: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines	6
II	**Block Ciphers and Advanced Encryption Standard** Block Cipher Principles, The Data Encryption Standard (DES), A DES Example, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles Block cipher modes of operations, Introduction to AES	6
III	**Number Theory and Asymmetric Key Cryptography:** Prime Number, relatively prime numbers, Modular Arithmetic, Fermats and Eulers Theorem, The Chinese Remainder Theorem, Discrete logarithms, Public Key Cryptography and RSA - Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management, Diffie-Hellman Key Exchange	8
IV	**Cryptographic Data Integrity Algorithms** **Cryptographic Hash Functions**: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Secure Hash Algorithm (SHA), SHA-3 **Message Authentication Code:** Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC **Digital Signatures:** Elgamal Digital Signature Scheme, DSS, NIST Digital Signature Algorithm	8
V	**Mutual Trust and Key Management** **Key Management and Distribution:** Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates	5
VI	**Network and Internet Security** **Transport-Level Security:** Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS **Electronic Mail Security:** Pretty Good Privacy, S/MIME, **IP Security:** IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, Cryptographic Suites	6

Text Books	
4.	Williams Stallings – Cryptography and Network security principles and practices, Pearson Education (LPE), Sixth Edition
Reference Books	
1.	Cryptography and network security – Atul Kahate (TMGH)
2.	Handbook of Applied Cryptography - Menezes, A. J., P. C. Van Oorschot, and S. A. Vanstone
3.	Schneier, Bruce, “Applied Cryptography: Protocols & Algorithms”

Year, Program, Semester	Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII					
Course Code	OEC 411					
Course Category	Open Elective Course					
Course title	Open Elective-II : Cyber Laws					
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits
	03	-	-	03		03
Evaluation Scheme	ISE	ESE	IE	EE	Total	
	30	70	-	-	100	
Pre-requisites(if any)	The prerequisite for this course is basic knowledge of Computer Systems.					
Course Objectives	**The Course is aimed to-** 1. Give knowledge of the Object and Scope of the IT Act 2. Explain E-Governance and IT Act 2000 and use of electronic records and digital signatures in Government and its agencies 3. Develop understanding of Certifying Authority and Digital Signature Certifications 4. Provide an overview of Domain Name Disputes and Trademark Law 5. Enhance knowledge of Cyber Crimes 6. Discuss the concept of E-banking and legal issues.					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Explain the Object and Scope of the IT Act 2. Understand E-Governance and IT Act 2000 and use of electronic records and digital signatures in Government and its agencies 3. Understand Certifying Authority and Digital Signature Certifications 4. Explain an overview of Domain Name Disputes and Trademark Law 5. Discuss knowledge of Cyber Crimes 6. Describe the concept of E-banking and legal issues					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1						1									
CO 2	1					1									
CO 3	2	1			1										
CO 4	2	1			1	1		1							
CO 5	1					1		1							
CO6	1	1			1	1		1							

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Object and Scope of the IT Act** Genesis, Object, Scope of the Act, Amendments.	4
II	**E-Governance and IT Act 2000** Legal recognition of electronic records, Legal recognition of digital signature, Use of electronic records and digital signatures in Government and its agencies, Different offences under IT Act, 2000	7
III	**Certifying Authorities** Need of Certifying Authority and Power, Appointment, function of Controller, Who can be a Certifying Authority, Digital Signature Certifications, Generation, Suspension and Revocation of Digital Signature Certificate.	7
IV	**Domain Name Disputes and Trademark Law** Concept of Domain Names, New Concepts in Trademark Jurisprudence, Trademarks & Domain Names Related issues, Cybersquatting, Reverse Hijacking, Meta tags, Framing, Spamming, Digital Copyright, Jurisdiction in Trademark Dispute.	7
V	**The Cyber Crimes (S-65 to S-74)** Cyber Crimes against Individuals, Institution and State, Tampering with Computer Source Documents(S-65), Hacking with Computer System(S-66),Publishing of Information Which is Obscene in Electronic Form(s-67), Offences : Breach of Confidentiality & Privacy (S-72), Offences : Related to Digital Signature Certificate (S-73 & S-74)	8
VI	**E-banking and legal issues** Regulating e-transactions, Role of RBI and legal issues, International transactions of e-cash, Credit card and internet, Laws relating to internet credit cards	6

Reference Books

1.	Farooq Ahmad, Cyber Law in India – Pioneer Books
2.	Vakul Sharma Information Technology Law and Practice – Universal Law Publishing Co. Pvt. Ltd.
3.	Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).
4.	Chris Reed & John Angel, Computer Law, OUP, New York, (2007)
5.	Suresh T Vishwanathan, The Indian Cyber Law – Bharat Law house New Delhi.
6.	P.M. Bakshi & R.K.Suri, Hand book of Cyber & E-commerce Laws – Bharat Law house, New Delhi.
7.	Rodney D. Ryder, Guide to Cyber Laws – Wadhwa and Company Nagpur.
8.	The Information Technology Act, 2000 – Bare Act – Professional Book Publishers – New Delhi.

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII</td></tr>
<tr><td>Course Code</td><td colspan="5">OEC 411</td></tr>
<tr><td>Course Category</td><td colspan="5">Open Elective Course</td></tr>
<tr><td>Course title</td><td colspan="5">Open Elective II: IT for Engineers</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">Basic understanding of Web Technology</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The Course is aimed at-
1. Introducing fundamental web technologies including website creation, browsers, servers, and HTML for building basic web pages.
2. Developing knowledge of scripting languages with emphasis on PHP and JavaScript for creating dynamic and interactive web applications.
3. Providing understanding of database concepts and MySQL operations for data storage and retrieval in web applications.
4. Building awareness of networking fundamentals and devices required for web and network-based applications.
5. Enhancing practical skills to integrate web, scripting, database, and networking components into simple applications.
6. Encouraging application-oriented learning through the design and development of interactive and information systems.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –
1. Explain the working principles of websites, browsers, servers, and HTML tags.
2. Apply scripting concepts using PHP and JavaScript to develop dynamic web pages.
3. Apply database concepts and MySQL commands to store, retrieve, and manage web data.
4. Explain networking concepts, protocols, and networking devices used in web environments.
5. Develop simple interactive, database-driven, and multimedia web applications.
6. Integrate web, database, and networking technologies to design basic information systems.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1			1										
CO 2	3	3	2		3								1	1	
CO 3	3	3	2		2										1
CO 4	2	2													
CO 5	3	3	3	1	3						2				
CO6	2	3	3	1	3						2	2			

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Web Essentials** Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server – HTML basics – HTML tags and their uses.	7
II	**Scripting Essentials** Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and HTML - Cookies – Sessions - Authentication – Introduction to JavaScript	6
III	**Database Essentials** Database management - Database terms - MySQL - commands – Data types – Indexes – Functions. – Accessing MySQL using PHP.	7
IV	**Networking Essentials** Fundamental computer network concepts - Types of computer networks - - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi	7
V	**Networking Components and Devices** Network Routing - Switching - Hub, Bridge, Gateway, Modem, Repeater, Access Point.	5
VI	**Application Essentials** Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications	7
Text Books		
i)	Robin Nixon, *"Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014*	
ii)	James F. Kurose, *"Computer Networking: A Top-Down Approach", Sixth Edition, Pearson, 2012.*	
Reference Books		
i)	Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012	
ii)	R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.	

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII</td></tr>
<tr><td>Course Code</td><td colspan="5">OEC 411</td></tr>
<tr><td>Course Category</td><td colspan="5">Open Elective Course</td></tr>
<tr><td>Course title</td><td colspan="5">Open Elective II : Data Mining and Warehousing</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">The knowledge of Database Engineering, Advanced Database Management System</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The Course is aimed at-
1. Describing the concepts of database technology for the need of data mining and its applications.
2. Elaborating different models used for OLAP and data pre-processing. Apply pre-processing statistical methods for any given large amount of raw data.
3. Explaining the performance of different data mining methods and tools.
4. Helping the study students, various developing areas in data mining as web mining, text mining, spatial mining, temporal mining and Identifying business applications of data mining.
5. Explaining critical thinking, problem-solving, and decision-making skills.
6. Interpreting the contribution of data warehousing and data mining to the decision support level of organizations.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –
1. Understand the role of data warehousing and enterprise intelligence in industry.
2. Compare and contrast the dominant data mining algorithms.
3. Evaluate and select appropriate data-mining algorithms and apply, and interpret, report the output appropriately.
4. Design and implement of a data-mining application using sample, realistic data sets and modern tools.
5. Evaluate and implement a wide range of emerging and newly-adopted methodologies and Technologies to facilitate the knowledge discovery.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2				2						1			
CO 2	3	3		2											
CO 3	2	3	2	2	2										
CO 4	2	3	3	2	3				2		2				
CO 5	2	2	2	2	3							3			

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Machine Learning and Data Mining-Data Flood, Data Mining and Knowledge Discovery, Data Mining Tasks Data Preparation for Knowledge Discovery, Data understanding, Data cleaning, Data transformation, False "predictors", Feature reduction, Randomization, Learning with unbalanced data.	5
II	Knowledge Representation - Decision tables, Decision trees, Decision rules, Rules involving relations, Instance-based representation ,Classification -Statistical Based Algorithms, Decision Trees Based Algorithms, Neural Networks Based Algorithms, Rules, Regression, Instance-based (Nearest neighbor), Case study.	7
III	Clustering: Introduction, Clustering Methods, Ways of scaling clustering algorithms, Case study.	5
IV	Associations: Transactions, Frequent itemsets, Association rules, Applications.	8
V	Data warehousing, OLAP and Data mining, web warehousing, Schema integration and data cleaning, De-duplication, Data marts: Multidimensional databases (OLAP). ETL, Integrating OLAP and mining, Online aggregation, Recap, future and visions.	8
VI	**Advanced Topics :** Mining Multimedia Databases, Text Mining, Web Mining, Spatial Mining, Temporal Mining Applications and Trends in Data Mining- Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining, Social impacts of Data Mining, Trends in Data Mining.	6
Text Books		
i)	Jiawei Han, Micheline Kamber. Data Mining: Concepts and Techniques.	
ii)	Margaret H. Dunham. Data Mining-Introductory and Advanced Topics.	
Reference Books		
i)	Soumen Chakrabarti Mining the Web- Discovering Knowledge from Hypertext Data.	
ii)	Pang-Ning Tan, Michael Steinbach, Vipin Kumar. Introduction to Data Mining.	
iii)	Heikki Mannila, Padhraic Smyth, David Hand. Principles of Data Mining.	

Year, Program, Semester	**Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII**					
Course Code	**PCC414**					
Course Category	**Program Core Course**					
Course title	**Web Technology Lab**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	-	**-**	**02**	**02**		**01**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	-		**-**	**50**	**50**	**100**
Pre-requisites(if any)	The knowledge of basic web technology					
Course Objectives	**The Course is aimed to-** 1. Demonstrate the Configuration of an asp.net application. 2. Helps to create ASP.Net applications using standard .net controls and to create a data driven web application. 3. Helps to create a Web Application with security 4. Helps to create and Maintain session and controls related information for user used in multi-user web applications 5. Introduce the fundamentals of developing modular application by using MVC 6. Introduce the fundamentals of web services and xml services					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Design web applications using ASP.NET 2. Use ASP.NET controls in web applications. 3. Create database driven ASP.NET web applications and web services 4. Handle database using MVC in ASP.NET web applications 5. Understand concept of ADO.NET 6. Configuring and testing web services on web					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1													
CO 2		2	3		2										
CO 3	2				3										
CO 4	3	2		1											
CO 5	3	2			2										
CO6	3	2													

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction to ASP.NET** The Evolution of Web Development, Important facts about Web Development, ASP.NET Architecture, The Code Model, Web Project. Web Forms: Page Processing, Web Form Processing Stages, The Page as Control Container, The Page Class. Redirecting User to Another Page, Master Pages.	04
II	**ASP.NET** Server Controls: Types of Server Controls, HTML Server Controls, Web Controls, List Controls, Input Validation Controls, Rich Controls State Management: ASP.NET State Management, View State, Transferring Information between pages, Cookies, Session State, Application State ASP.NET Application: Anatomy of ASP.NET application, global. asax Application file, ASP.NET Configuration, ASP.NET State Management, Web Configuration File and Global. asax, Authentication & Authorization	06
III	**ADO.NET Fundamentals** ADO.NET Architecture, The Connection Class, The Command and Data Reader Classes, Data Binding: Basic Data binding, Data source Control, The Sql Data Source.	04
IV	**Introduction to MVC:** MVC Architecture, Understand the MVC design pattern and how its applied in ASP.NET MVC, Understanding Model, Understanding View, Understanding Controller, Key benefits of ASP.NET MVC, Advantages of MVC based Web Application	04
V	**File Handling, Crystal Report and E-mail handling :** File I/O and streams , Working with directories and files, Read and write file Crystal reports, Overview to crystal reports, Creating crystal reports with wizards, Integrating with web applications, Customizing the report viewer, Adding a database or table to a report, Handling mail, Protocols , Sending mails with and without attachment	06
VI	**Web Services :** ASP.NET Web Services, Introduction to XML Web Services, Creating Web Service, Setting the Web Service attribute, Test and run your web	02

List of Experiments

Sr.No.	Experiment Name
1.	Introduction to ASP.NET
2.	Implement asp.net program to redirect user from one page to another page using different methods.
3.	Implement asp.net program for View state.
4.	Implement asp.net program for book catalog with validation controls.
5.	Implement asp.net program for registration form using validation controls.
6.	Create a web application which implement authentication and authorization features.
7.	create web application for data transfer from one page to another
8.	Write a program to develop sample application for session management using asp.net
9.	Write a program to create a web application which detects capabilities of browser
10.	Study of architecture of ADO. NET
11.	Write a program to access database using SqlDataSource in asp. Net
12.	Write a program to Display parameterized data using GridView in ASP.NET.
13.	Study of architecture of MVC

General Instructions:

Install and configure Microsoft Visual Studio Community version.

Perform ASP.NET program on visual studio.

Suggested Text Books/ Reference Books/Manual	
1.	Matthew MacDonald, Professional ASP.NET 3.5 in C# 2008, [WileyAPRESS Publication]
2.	Beginner‟s ASP.net 3.6 in c# and VB.net [WROX].
3.	ASP.net Complete Reference [Book by Matthew MacDonald]
4.	Professional ASP.NET MVC 5 [Book by Brad Wilson, David Matson, Jon Galloway, and Kevin Scott Allen]

Year, Program, Semester	Final Year B.Tech. (Computer Science and Technology) , Part VII, Semester VII					
Course Code	PBL411					
Course Category	Project Based Learning					
Course title	Major Project-I					
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits
	-	-	04	04		02
Evaluation Scheme	ISE		ESE	IE	EE	Total
	-		-	50	50	100
Pre-requisites(if any)	Programming Knowledge, coding ad knowledge of designing.					
Course Objectives	**The Course is aimed to-** 1. Identify selection and initiation of individual projects and of portfolios of projects in the enterprise. 2. Recognize the need and ability to engage in lifelong learning. 3. Conduct project planning activities that accurately forecast project costs, timelines, and quality. 4. Function effectively on teams and to communicate effectively					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Describe the need of a software project for the society 2. Identify requirement analysis like functional and technical requirements for the project 3. Come up with design documents for the project consisting of Architecture, Dataflow diagram, class diagram, Algorithmic descriptions of various modules, collaboration diagram, ER Diagrams, Database 4. Demonstrate analysis and design. 5. Prepare the technical Design Phase-1 report					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	-	-	-	-	-	1	-	-	-	1	-	-	-
CO 2	2	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO 3	2	2	3	2	3	-	-	-	-	-	-	2	-	-	-
CO 4	2	3	3	2	2	-	-	-	2	2	-	1	-	-	-
CO 5	1	2	2	-	2	-	-	1	2	3	3	1	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Course Content
The project work is to be carried out in two semesters of Final Year B.Tech. The project should be undertaken preferably by group of 4-5 students who will jointly work and implement the project in the two semesters.

In Semester VII, The group will select a project with the approval of the Guide (teaching faculty) and submit the name of the project with a synopsis of the proposed work of not more than 02 to 08 pages before second week of August in the academic year. The group is expected to complete detailed system design, analysis, data flow design, procurement of hardware and/or software, implementation of a few modules of the proposed work at the end of semester –VII as a part of the term work submission in the form of a joint report.

The term work assessment will be done jointly by teachers appointed by Head of the Department.

The oral examination will be conducted by an internal and external examiner as appointed by the University.

Note:

1. Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
2. Two mid-term evaluations should be done, which includes presentations and demos of the work done.
3. Care should be taken to avoid copying and outsourcing of the project work.

Year, Program, Semester	**Final Year B. Tech. (Computer Science and Technology) , Part IV, Semester VII**					
Course Code	**VEC411**					
Course Category	**Value Education Course**					
Course title	**Green Technology & Sustainability**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	01	**-**	**-**	**01**		**01**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	-		**-**	**50**	**-**	**50**
Pre-requisites(if any)	Environment studies					
Course Objectives	**The Course is aimed to-** 1. Understand the core principles of sustainability. 2. Explain green technology and eco-innovation concepts. 3. Assess environmental impacts of engineering systems. 4. Identify renewable and resource-efficient alternatives. 5. Integrate sustainable practices in design and operation. 6. Promote responsible and ethical engineering decisions.					
Course Outcomes	**Upon completion of this course, student should be able to -** 1. Explain sustainability and green engineering principles. 2. Identify major environmental and resource issues. 3. Apply life-cycle and impact assessment tools. 4. Evaluate cleaner and renewable technologies. 5. Design eco-efficient and sustainable solutions. 6. Communicate sustainability ideas effectively.					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	-	0	-	2	3	2	-	1	-	1	1	-	3
CO 2	2	2	-	1	-	2	3	-	-	-	-	1	2	2	-
CO 3	2	3	2	2	2	-	3	-	-	-	-	2	1	1	2
CO 4	1	2	3	2	2	1	3	1	-	1	-	2	2	-	-
CO 5	1	2	3	2	2	2	3	2	1	2	2	3	3	2	-
CO 6	-	-	1	-	1	-	2	2	2	3	1	2	2	-	3

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	**Course Content**	**Hours**
I	**Sustainability Fundamentals** Definition and dimensions of sustainability (environmental, social, economic), Sustainable Development Goals (SDGs) and their engineering relevance, Principles of green engineering and sustainable innovation	2
II	**Environmental Challenges & Resource Management** Global and local environmental issues, Energy, water, and material resource depletion, Waste generation and its impact across industries	2

III	**Green Technologies & Eco-Innovation** Concepts and case studies in clean and green technologies, Sustainable materials, cleaner manufacturing, digital sustainability (IoT, AI for energy management)**,** Smart cities, green buildings, and sustainable mobility	3
IV	**Life Cycle Thinking & Environmental Assessment** Basics of Life Cycle Assessment (LCA)**,**Carbon and water foot printing**,** Environmental performance indicators and sustainability metrics	3
V	**Renewable Energy and Sustainable Systems** Solar, wind, hydro, bioenergy, and hydrogen systems**,** Energy conservation and efficiency improvement**,** Integration of renewable technologies into engineering design	3
VI	**Circular Economy & Sustainable Future** Waste-to-wealth concepts, product stewardship, recycling loops, Ethical, economic, and policy aspects of sustainability	2

Text/Reference Books	
I.	Allen, D.T., & Shonnard, D.R. (2001). Green Engineering: Environmentally Conscious Design of Chemical Processes. Prentice Hall, New Jersey.
II.	Anastas, P.T., & Zimmerman, J.B. (2018). The Twelve Principles of Green Chemistry and Engineering. Oxford University Press, Oxford.
III.	Graedel, T.E., & Allenby, B.R. (2010). Industrial Ecology and Sustainable Engineering. Pearson Education, New Jersey.
IV.	Rao, S.S., & Parulekar, A.H. (2022). Sustainable Engineering: Concepts, Design, and Case Studies. McGraw-Hill Education, New Delhi.
V.	Azapagic, A., Perdan, S., & Clift, R. (2004). Sustainable Development in Practice: Case Studies for Engineers and Scientists. John Wiley & Sons, Chichester.

Year, Program, Semester	Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII					
Course Code	PSI 412					
Course Category	Project Seminar Internship					
Course title	**MDM Based Industry Internship**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	--	**--**	**--**	**One month duration**		**03**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	--		**--**	**50**	**50**	**100**
Pre-requisites(if any)	Introduction to Internet of Things, Embedded Systems for IoT, IoT with Arduino, ESP & Raspberry Pi					
Course Objectives	**The Course is aimed to-** 1. Integrate multidisciplinary knowledge in real-world IoT projects. 2. Work effectively with IoT hardware and software tools in practical setups. 3. Understand professional workflows, documentation, and industry practices. 4. Develop and present a project or module addressing an IoT problem. 5. Demonstrate professional communication, teamwork, and ethical practices.					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Apply theoretical IoT concepts to practical problems. 2. Deploy sensors, embedded platforms, and communication modules. 3. Integrate IoT systems with cloud services and dashboards. 4. Prepare a technical internship report with analysis and results. 5. Present internship work effectively in oral/viva-voce examination.					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1													
CO 2		2	3		2										
CO 3	2				3										
CO 4	3	2		1											
CO 5	3	2			2										
CO6	3	2													

Level of Mapping as: Low 1, Moderate 2, High 3

Course Content
MDM based Industry Internship to be completed during any winter/summer vacation slots 4th Semester onwards before 7th semester commencement. This internship enables students to apply for developing IoT-based solutions integrating sensors, embedded systems, networking, cloud platforms, and data analytics. Students should analyze real-world industrial problems, design and implement end-to-end IoT systems, and evaluate performance using industry tools and standards. More focus is given to professional engineering practices. Internship report should include following contents: 1. Title Page 2. Internship Certificate 3. Acknowledgements 4. Executive Summary 5. Introduction to Organization & IoT Context 6. Objectives & Tasks Undertaken 7. Methodology & Tools Used 8. Results & Discussion 9. Challenges & Learning 10. Conclusion & Future Scope 11. References 12. Appendix (code/schematics/screenshots

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII</td></tr>
<tr><td>Course Code</td><td colspan="5">PSI 421</td></tr>
<tr><td>Course Category</td><td colspan="5">Project Seminar Internship</td></tr>
<tr><td>Course title</td><td colspan="5">Industrial Internship</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td colspan="4">Entire Semester to be spent in industry</td><td>10</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">-</td><td>-</td><td>150</td><td>100</td><td>250</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">The knowledge of Mini Project, Seminar and programming languages for coding</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The Course is aimed at-
1. Providing exposure to corporate culture.
2. Providing exposure to latest technologies used in the industry.
3. Learning to communicate efficiently.
4. Helping to apply fundamental principles of Computer Science in real-world problems.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –
1. Apply fundamental principles of Computer Science.
2. Become specialized in a particular technology domain.
3. Become updated with all the latest changes in technological world.
4. Communicate efficiently.
5. Identify, formulate and model problems and find engineering solution based on a systems approach.
6. Get awareness of the social, cultural, global and environmental responsibility as an engineer.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	2										
CO 2	2	2	2	-	3							3			
CO 3	1		3		3							3			
CO 4									2	3					
CO 5	2	3	3	2	2				3		2				
CO6						3	2	3	2						

Level of Mapping as: Low 1, Moderate 2, High 3

Course Content

As per the approved academic structure, students have to take internships in the 8th semester of B. Tech program. Below are the guidelines/rules and regulations for the students willing to opt for the internship.

- The internship shall be carried out for one full semester in an approved industry, R&D organization, startup, or reputed IT organization.
- The internship organization must be approved by the institute/department.
- Students must submit an offer letter / confirmation letter before joining.
- Follow-up to be taken by one of the faculty member acting as a guide/mentor from the specific program.
- Students must strictly follow the rules, regulations, and work ethics of the organization.
- Change of internship organization is not permitted without prior written approval from the institute.
- At the end of the training, the student will submit a report as per the prescribed format to the department.
- Submission of Internship Completion Certificate is mandatory.
- Failure to complete the internship or submit required documents will result in non-award of credits for the course.

Course Assessment

The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made with his/her problem - solving ability, technical competence/skill etc. IE/EE Marks will be awarded and appropriate grades assigned as per the rules and regulations.

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII</td></tr>
<tr><td>Course Code</td><td colspan="5">PEC 421</td></tr>
<tr><td>Course Category</td><td colspan="5">Program Elective Course</td></tr>
<tr><td>Course title</td><td colspan="5">Program Elective –III Through MOOC: Deep Learning</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">Knowledge of Linear Algebra</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The Course is aimed to-
1. Introduce the fundamental concepts of Deep Learning, Bayesian learning principles, and linear classification models for understanding decision boundaries in high-dimensional data.
2. Enable students to understand optimization techniques and neural network fundamentals, including multilayer perceptrons and backpropagation learning.
3. Familiarize students with unsupervised deep learning techniques and convolutional neural networks for feature extraction and representation learning.
4. Impart knowledge of advanced optimization algorithms and regularization techniques for effective and stable training of deep neural networks.
5. Expose students to recent deep learning architectures and their application to classical supervised vision tasks.
6. Introduce sequence modeling and generative deep learning frameworks for learning complex data distributions.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –
1. Explain deep learning concepts and analyze decision surfaces using Bayesian learning and linear classification models.
2. Apply gradient-based optimization techniques and implement multilayer neural networks using backpropagation learning.
3. Develop and analyze unsupervised learning models and convolutional neural networks for feature learning and transfer learning tasks.
4. Evaluate the effectiveness of advanced optimizers and regularization techniques to improve convergence and generalization of deep networks.
5. Design and apply modern deep learning architectures to solve supervised computer vision problems such as object detection and segmentation.
6. Analyze and implement sequence models and generative deep learning techniques such as LSTM, VAE, and GAN for complex data modeling.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	0	0	1	0	0	0	0	0	0	1	1	0	0
CO 2	2	2	1	2	3	0	0	0	0	0	0	1	2	0	1
CO 3	2	2	2	2	3	0	0	0	0	0	0	1	3	0	2
CO 4	1	2	1	3	3	0	0	0	0	0	0	1	3	0	2
CO 5	1	2	3	2	3	0	0	0	0	0	0	1	3	0	3
CO 6	1	2	2	2	3	1	1	0	0	0	0	1	3	1	3

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Introduction to Deep Learning, Bayesian Learning, Decision Surfaces, Linear Classifiers, Linear Machines with Hinge Loss	6
II	Optimization Techniques, Gradient Descent, Batch Optimization, Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning	7
III	Unsupervised Learning with Deep Network, Autoencoders, Convolutional Neural Network, Building blocks of CNN, Transfer Learning	7
IV	Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam, Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization	6
V	Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc., Classical Supervised Tasks with Deep Learning, Image Denoising, Semanticd Segmentation, Object Detection etc.	6
VI	LSTM Networks, Generative Modeling with DL, Variational Autoencoder, Generative Adversarial Network Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam	6

Text/Reference Books	
i)	Deep Learning- Ian Goodfelllow, Yoshua Benjio, Aaron Courville, The MIT Press
ii)	Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Year, Program, Semester	**Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII**					
Course Code	**PEC 421**					
Course Category	**Program Elective Course**					
Course title	**Program Elective –III Through MOOC: E-commerce**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	03	**-**	**-**	**03**		**03**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	30		**70**	**-**	**-**	**100**
Pre-requisites (if any)	Knowledge of Linear Algebra					
Course Objectives	**The Course is aimed to-** 1. Elaborate the students to fundamentals of E-commerce. 2. Help to make students to learn techniques of communication needed for business operations. 3. Help students to learn and handle risk and legal issues associated to Ecommerce. 4. Describe various E-Commerce business models. 5. Describe and discuss various opportunities and potential of Ecommerce.					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Demonstrate and understand the foundations and importance of E-commerce. 2. Understand the impact of Information and Communication technologies, especially of the Internet in business operations. 3. Comprehend risk, legal issues and privacy in ECommerce and Assess electronic payment systems 4. Analyze the critical building blocks of E-Commerce and different types of prevailing business models employed by leading industrial leaders. 5. Evaluate the opportunities and potential to apply and synthesize a variety of Ecommerce concepts and solutions to create business value for organizations, customers, and business partners.					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	-	-	1	-	-	-	-	1	-	1	2	2	1
CO 2	2	2	-	-	3	-	-	-	-	1	-	-	2	3	2
CO 3	-	3	-	-	2	3	2	3	1	1	-	-	1	2	1
CO 4	1	2	3	-	2	1	-	-	1	1	2	-	3	3	-
CO 5	1	2	3	1	3	1	1	-	-	2	2	2	3	3	1

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction** E-Commerce: meaning advantages & disadvantages, incentives for engaging in electronic commerce, impact of e-commerce on business and e business, electronic commerce framework, types of e-commerce, web background.	6
II	**Risk and Legal Issues in E-Commerce** Risks and barriers in the adoption of e-business environment, the impact of ICT in contemporary business operations, entrepreneurial development in e commerce, cloud computing and e Commerce, e-commerce in India – laws for e-commerce in India, crypto currency and e commerce.	7
III	**Ethical and Social and Political issues related to Electronic Commerce** Protecting privacy, protecting Intellectual property, copyright, trademarks and patents, taxation and encryption policies.	7
IV	**E-Commerce Business Models** Key element of a business model, major B2C business models, major B2B business models, business models in emerging e-commerce areas. **E-Government:** issues in e-governance applications, benefits and reasons for the introduction of e- governance, e-governance models.	7
V	**Electronic Payment Systems** Types, digital wallet, digital cash, payment through card system, e–cheque, e–cash, e–payment threats & protections, smart cards electronic payment systems, risk in electronic payment Systems, secure electronic transaction protocol, e– marketing: home –shopping, e-marketing, Tele-marketing, digital marketing.	7
VI	**Electronic Data Interchange (EDI)** Meaning, benefits, concepts, application, EDI model, protocols, e-procurement, future of e commerce and latest technology: Storefront digitizing, Chabot, beacon technology, direct social media purchase, voice assistants, drone and droid delivery, augmented reality device etc.	6

Text/Reference Books	
I.	Kenneth C Lauden, Carol G. Traver, "E-Commerce", Perason Education, ISBN 97881317812.
II.	Doing Business on the Internet E-COMMERCE (Electronic Commerce for Business) :S. Jaiswal, Galgotia Publications, ISBN 9788175153059
III.	E-Business, Bookseller Code (AG) OXFORD, 1st edition Parag Kulkarni, Sunita Jahirabadkar & Pradip Chande, ISBN 9780198069843
IV.	P. T. Josef, "Electronic Commerce- A managerial perspective" Prentice-Hall International, ISBN 8120320891
V.	Kamlesh K. Bajaj, Debjani Nag, "Electronic Commerce: The cutting edge of business", Tata McGraw-Hill Publishing Co. Ltd, 2000, ISBN 9780070585560.
VI.	SJeffrey F. Rayport, Bernard J. Jaworski, "e-Commerce", Tata McGraw Hill, 2002, ISBN 9780072510249.
VII.	Pete Loshin, Paul A. Murphy, "Electronic Commerce", Jaico Publishing House, 2000, ISBN 9788172246662.
VIII.	Ravi Kalakota, Andrew B. Whinston, "Frontiers of Electronic Commerce", Addison Wesley, 2002, ISBN 0201845202

<table>
<tr><td>Year, Program, Semester</td><td colspan="6">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VII</td></tr>
<tr><td>Course Code</td><td colspan="6">PEC 421</td></tr>
<tr><td>Course Category</td><td colspan="6">Program Elective Course</td></tr>
<tr><td>Course title</td><td colspan="6">Program Elective –III Through MOOC*: Internet of Things</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td colspan="2">Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>--</td><td>--</td><td colspan="2">03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td></td><td></td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="6">The knowledge of basics of Internet of things.</td></tr>
<tr><td>Course Objectives</td><td colspan="6">The Course is aimed to-
1. Introduce the fundamental concepts of Internet of Things including sensing, actuation and networking.
2. Understand IoT communication protocols, sensor networks and machine-to-machine communication.
3. Provide knowledge of IoT programming using Arduino, Python and Raspberry Pi.
4. Explore emerging networking paradigms such as SDN, Fog and Cloud computing for IoT.
5. Study real-world IoT applications in smart cities, industry, agriculture and healthcare.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">Upon completion of this course, student should be able to –
1. Explain IoT concepts, sensing, actuation and networking fundamentals.
2. Analyze IoT communication protocols and sensor networks.
3. Develop basic IoT applications using Arduino and Raspberry Pi.
4. Apply SDN, Cloud and Fog computing concepts to IoT systems.
5. Evaluate IoT applications in smart cities, industry and healthcare</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2													
CO 2	3	2	3												
CO 3	3		3	2											
CO 4	3	2	3	2	3										
CO 5		2	3	2	3										
CO6	3	2	3	2	3										

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction to IoT** Definition of IoT, characteristics, IoT architecture, evolution and history, trends and applications, risks and challenges, IoT security issues, sensor networks, introduction to AI in IoT	05
II	**IoT Communication Protocols:** Overview of IoT protocols (MQTT, CoAP, HTTP, 6LoWPAN), introduction to Contiki OS, protocol stack, implementation of communication protocols in Contiki OS	08
III	**Introduction to Arduino:** Arduino overview and applications, Arduino architecture, pin diagram, ATmega328P microcontroller, basics of sensor connectivity, introduction to Arduino IDE	06
IV	**IoT Programming and Hardware Platforms**: Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino, Introduction to Python Programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi	07
V	**SDN, Cloud and Fog Computing for IoT:** Implementation of IoT with Raspberry Pi Introduction to Software Defined Networking (SDN), SDN architecture and components, SDN for IoT, Data handling and analytics in IoT, Cloud Computing and service models, Sensor–Cloud integration, Fog Computing	07
VI	**IoT Applications and Case Studies:** Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT, Case Studies: Agriculture, HealthCare, Activity Monitoring	04
Text and Reference Books		
i)	S. Misra, A. Mukherjee, and A. Roy, 2020. *Introduction to IoT*.	
ii)	S. Misra, C. Roy, and A. Mukherjee, 2020. *Introduction to Industrial Internet of Things and Industry*	
iii)	Internet of Things: A Hands-On Approach by Arshdeep Bahga and Vijay Madisett	

Year, Program, Semester	**Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII**					
Course Code	**PEC 421**					
Course Category	**Program Elective Course**					
Course title	**Program Elective –III** Through MOOC*: **Project Management**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	03	**-**	**-**	**03**		**03**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	30		**70**	**-**	**-**	**100**
Pre-requisites (if any)	Basic understanding of software engineering.					
Course Objectives	**The Course is aimed at-** 1. Developing an understanding of project management concepts, project life cycle, stakeholders, and the role of a project manager in IT projects. 2. Introducing project integration and scope management practices for effective project planning, execution, monitoring, and control. 3. Enhancing the ability to apply time and cost management techniques for scheduling, budgeting, and controlling project resources. 4. Providing knowledge of quality management principles and tools to improve project and IT system quality. 5. Building skills in human resource and communication management for effective teamwork and stakeholder coordination. 6. Equipping learners with risk and procurement management knowledge to handle uncertainties and vendor relationships in projects.					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Explain fundamental concepts of project management, project life cycle, stakeholders, and process groups. 2. Apply project integration and scope management techniques to plan and control IT projects. 3. Apply time and cost management tools for project scheduling, estimation, and control. 4. Analyze quality management practices and tools to improve project performance. 5. Demonstrate effective human resource and communication management strategies in project environments. 6. Analyze project risks and procurement processes to support informed decision-making.					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1									2				
CO 2	2	3	2		1						3			2	
CO 3	2	3	2		1						3				1
CO 4	2	3		2							2				
CO 5	1	2							3	3	3				
CO6	1	3		2		2					3	2			

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction to Project Management** Project, project management (PM), role of project manager, project management profession, system view of PM, organization, stakeholders, project phases and lifecycle, context of IT projects, process groups, mapping groups to knowledge areas.	7
II	**Project Integration Management** Strategic planning and project selection, preliminary scope statements, project management plans, project execution, monitoring and controlling project work, integrated change control, closing project, software assistance.	6
III	**Scope and Time Management** Scope planning and scope management plan, scope definition and project scope statement, creating the work breakdown structure, scope verification and control, software assistance, Time Management-Importance of project schedules, activity - definition, sequencing, resource estimating, duration estimating; schedule development and control, software assistance.	7
IV	**Cost and quality management** Importance, basic principles, cost estimating, budgeting and control, software assistance, Quality management- Importance, quality - planning assurance control, tools and techniques, modern quality management and improving IT project quality, software assistance.	6
V	**Human Resource management** Importance, keys to managing people, human resource planning, acquiring, developing and managing project team, software assistance, Communication management-Importance, communication planning, information distribution, performance reporting, managing stakeholders, suggestions for improving project communication, software assistance.	6
VI	**Risk and procurement management** Importance, risk management planning, sources of risk, risk identification, qualitative and quantitative risk analysis, risk response planning, risk monitoring and control, software assistance, Procurement management- Importance, planning purchases and acquisitions, planning contracting, requesting seller responses, selecting sellers, administering the contract, closing the contract, software assistance.	7
Text Books		
i)	*Information Technology Project Management (4th Edition*) – Kathy Schwalbe (Cengage learning – India Edition).	
Reference Books		
i)	Mantel Jr., Meredith, Shafer, Sutton with Gopalan *Project Management Core Textbook* – (Wiley India Edition)	
ii)	Harold Kerzner Project Management- *A systems Approach to planning, scheduling and controlling* - (John Wiley & Sons, Inc)	
iii)	Newtown Square *A Guide to the Project Management Body of Knowledge* (3rd Edition), PA, Project Management Institute, 2005.	

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII</td></tr>
<tr><td>Course Code</td><td colspan="5">PEC 422</td></tr>
<tr><td>Course Category</td><td colspan="5">Program Elective Course</td></tr>
<tr><td>Course title</td><td colspan="5">Program Elective –IV through MOOC* Data Science
(Exploratory Data Analysis for Data Science with R Software (English))</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">The knowledge of Database Engineering, Advanced Databases, Machine Learning</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The Course is aimed at-
1. Introducing students to the R programming environment and essential commands required for data exploration and analysis.
2. Developing an understanding of fundamental exploratory statistical concepts such as frequency distributions, cumulative distributions, and descriptive statistics.
3. Familiarizing students with graphical techniques for data visualization in one, two, and three dimensions using base R.
4. Enabling students to compute and interpret measures of central tendency, variation, moments, skewness, and kurtosis using R software.
5. Analyzing relationships among variables using graphical methods, correlation measures, and linear modeling techniques.
6. Providing exposure to sampling techniques and multivariate exploratory data analysis tools for real-world data interpretation.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –
1. Use R software effectively to import, manipulate, and explore datasets for data science applications.
2. Apply exploratory statistical methods to summarize data using frequency distributions, cumulative distributions, and descriptive measures.
3. Visualize data using appropriate graphical techniques, including advanced visualizations.
4. Compute and interpret measures of central tendency, dispersion, skewness, kurtosis, and moments using R.
5. Examine associations among variables using graphical methods, correlation coefficients, and linear regression models.
6. Implement sampling techniques and apply multivariate exploratory data analysis tools to gain insights from complex datasets.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2			3							2			
CO 2	3	3		2	2							2			
CO 3	2	2	2		3							2			
CO 4	3	3		2	2							2			
CO 5	3	3	2	3	2							2			
CO6	2	3	2	3	3							3			

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Introduction to various topics and commands in R software. Basic concepts of exploratory statistical data analysis, frequency and frequency distribution, cumulative distribution functions and their use with R software	6
II	Graphical procedures with various graphs in one, two and three dimensions. Graphical procedures with various graphs with ggplot2 package	6
III	Measures of central tendency and their use with R software. Measures of variation and their use with R software	7
IV	Moments, skewness, kurtosis and their use with R software. Association of variables through graphics.	6
V	Association of continuous variables, various correlation coefficients and their use with R software. Association of discrete variables and their use with R software. Fitting of linear models and their use with R software.	7
VI	Selection of samples and simple random sampling. Multivariate exploratory data analysis tools.	7
Books and References		
i)	Introduction to Statistics and Data Analysis- With Exercises, Solutions and Applications in R By Christian Heumann,Michael Schomaker and Shalabh, Springer,2022	

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII</td></tr>
<tr><td>Course Code</td><td colspan="5">PEC 422</td></tr>
<tr><td>Course Category</td><td colspan="5">Program Elective Course</td></tr>
<tr><td>Course title</td><td colspan="5">Program Elective-IV : Search Engine and Optimization</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">The prerequisite for this course is basic knowledge of Computer Systems.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The Course is aimed to-
1. Introduce fundamental concepts of domains, the World Wide Web, portals, search engines, and the working of search engines.
2. Enable students to understand search engine optimization (SEO) concepts, types of SEO techniques, and ethical SEO practices including white-hat and black-hat methods.
3. Develop the ability to perform SEO research and analysis including market research, keyword research, competitor analysis, and SWOT analysis of websites.
4. Provide knowledge of on-page optimization techniques to improve website structure, content quality, and search engine visibility.
5. Familiarize students with off-page optimization strategies such as link building, directory submission, and social media–based optimization methods.
6. Enable students to analyze website performance using SEO analytics tools, generate reports, and track SEO effectiveness using industry-standard tools.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –
1. Explain the basic concepts of domains, WWW, portals, search engines, and the working mechanism of search engines
2. Distinguish between different types of SEO techniques including white-hat and black-hat SEO practices
3. Perform SEO research and analysis using keyword research, competitor analysis, and SWOT analysis to identify optimization opportunities
4. Apply on-page optimization techniques to improve website structure, content, and indexing by search engines
5. Analyze and implement off-page optimization techniques to improve link popularity and search engine ranking
6. Use SEO analytics and reporting tools to track website performance and evaluate SEO effectiveness</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	-	-	1	-	-	-	-	-	-	-	-	--	-
CO 2	2	2	-	-	1	-	-	-	-	-	-	-	-	--	-
CO 3	2	3	2	2	3	-	-	-	-	-	-	-	-	--	-
CO 4	2	3	3	2	3	-	-	-	-	-	-	-	-	--	-
CO 5	2	3	3	2	3	-	-	-	-	-	-	-	-	--	-
CO6	1	2	2	3	3	-	-	-	-	-	-	-	-	--	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Basics for SEO:** What is Domain? Basic Knowledge of World Wide Web, Difference between Portal and Search Engines, What is SEO, Types of SEO Techniques, Black hat techniques, White Hat techniques, How Search Engine works	6
II	SEO Research & Analysis, Market Research, Keyword Research and Analysis, Keyword opportunity, Competitors Website Analysis, SWOT Analysis of Website, How to Choose Best Keywords, Tools available for Keyword Research	6
III	**On-page Optimization:** The Page Title, Meta Descriptions & Meta Keywords, Headings, Bold Text, Domain Names & Suggestions, Canonical Tag, Meta Tags, Images and Alt Text, Internal Link Building, The Sitemap, Invisible Text, Server and Hosting Check.	7
IV	**Off-page Optimization:** Page Rank, Link Popularity, Link Building in Detail, Directory Submission, Social Bookmark Submission, Blog Submission, Articles, Links Exchange, Reciprocal Linking, Posting to Forums, Submission to Search Engine	7
V	**Analytics:** Google Analytics, Installing Google Analytics, How to Study Google Analytics, Interpreting Bars & Figures, How Google Analytics can Help SEO, Advanced Reporting, Webmaster Central & Bing/Yahoo, Open Site Explorer, Website Analysis using various SEO Tools available.	7
VI	SEO Tools and Reporting: Keyword Density Analyzer Tools, Google Tools, Yahoo / Bing Tools, Rich Snippet Text Tools, Comparison Tools, Link Popularity Tools, Search Engines Tools, Site Tools, Google analysis, Tracking and Reporting	6

Reference Books

1.	Eric Enge et al., The Art of SEO: Mastering Search Engine Optimization, O'Reilly Media.
2.	Adam Clarke, SEO: Learn Search Engine Optimization, Latest Edition
3.	Bruce Clay, Search Engine Optimization All-in-One For Dummies, Wiley.
4.	Krista Seiden, Analytics Foundations for Digital Marketing, Peachpit.
5.	Jerri Ledford, SEO: Search Engine Optimization Bible, Wiley.

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII</td></tr>
<tr><td>Course Code</td><td colspan="5">PEC 422</td></tr>
<tr><td>Course Category</td><td colspan="5">Program Elective Course</td></tr>
<tr><td>Course title</td><td colspan="5">Program Elective –IV Through MOOC: Big Data Technology
(Statistical Foundation for Big Data Analysis)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">Exposure to linear algebra and probability</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The Course is aimed to-
1. Introduce the fundamental concepts of Big Data and establish the role of high-dimensional statistics as the mathematical foundation for Big Data Analysis.
2. Enable students to understand and apply classical statistical inference techniques such as estimation, confidence intervals, and hypothesis testing in data-driven problems.
3. Develop conceptual clarity on statistical learning principles including bias, variance, and bias–variance trade-off for evaluating and comparing learning models.
4. Impart knowledge of multivariate data structures, linear models, and multivariate probability distributions for modeling complex, high-dimensional datasets.
5. Familiarize students with multivariate analysis and dimensionality reduction techniques such as clustering and Principal Component Analysis for large-scale data interpretation.
6. Introduce network data analysis and random graph models for analyzing large interconnected systems such as social networks.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –
1. Explain Big Data characteristics and challenges, and distinguish between Big Data Analysis and Processing using appropriate statistical frameworks.
2. Apply point and interval estimation methods and perform hypothesis testing to draw valid statistical inferences from real-world datasets.
3. Analyze learning models by evaluating bias, variance, and mean squared error, and justify model selection using the bias–variance trade-off.
4. Develop and interpret multivariate linear models and analyze multivariate normal distributions for high-dimensional data scenarios.
5. Implement clustering and dimensionality reduction techniques such as K-means and PCA, and assess the impact of curse of dimensionality on model performance.
6. Analyze network data using random graph models and apply probabilistic laws to study large-scale social and networked systems.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	0	0	1	0	0	0	0	0	0	1	1	0	0
CO 2	3	3	0	2	1	0	0	0	0	0	0	1	2	0	0
CO 3	2	3	0	3	2	0	0	0	0	0	0	1	2	0	0
CO 4	3	3	1	2	2	0	0	0	0	0	0	1	2	0	1
CO 5	2	2	2	2	3	0	0	0	0	0	0	1	3	0	2
CO 6	2	3	0	2	2	1	1	0	0	0	0	1	2	1	2

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction:** What is big data? Examples/Case Studies of big data and challenges of handling big data. Big Data Analysis vs Big Data Processing. Role of high dimensional statistics as foundation of Big Data Analysis. General overview of statistical framework. Classical statistical analysis is inference from data using linear algebra and calculus. Big data analysis as inference from data using linear algebra, calculus and high performance computing	5
II	**Review of basic statistical inference 1:** **Point Estimation:** Unbiased Estimation, Maximum Likelihood Estimation, Method of Moments Estimation, Related Asymptotics and Case Studies **Review of basic statistical inference 2:** Concept of Interval Estimation with examples, Basics of Hypothesis Testing with examples	6
III	**Statistical Learning Theory 1:** Bias, Variance, Mean Squared Errors, Real life Examples / Case Studies. **Statistical Learning Theory 2:** Bias-Variance Trade Off and Real life Examples / Case Studies. Comparison between bias and variance of various competing estimation models with case studies	6
IV	**Basics of Multivariate data structure and classical Multivariable Linear Models:** Regression and Multivariate Regression, Gauss-Markov Theorem and its application **Multivariate Probability distributions with a stress on Multivariate Normal Distribution:** Introduction to the distribution, CDF and PDF, Normality and explicit expressions for conditionals, Linear And Affine Transformations of Multivariate Normal Distributions, Some other common multivariate distributions	9
V	**Multivariate Analysis And Dimensionality:** Concept of Unsupervised Learning, Hierarchical and Non Hierarchical Clustering and its applications (Real life examples / case studies focusing on what to use and when?), Detailed discussion on K-means clustering, Curse of dimensionality Asymptotic behavior of volume and its impact on K-means clustering **Population Principal Component Analysis:** Basic concept and applications with case studies **Sample Principal Component Analysis:** Basic concept and applications with case studies	8
VI	**Network Data Analysis:** Network Data, Random Graphs, Laws of Large Number For Random Graph **Application of random graphs to social network analysis:** Some case studies	4

Text/Reference Books	
i)	The Elements of Statistical Learning by Jerome H. Friedman, Robert Tibshirani, and Trevor Hastie
ii)	Applied Multivariate Statistical Analysis by Dean W. Wichern, Richard A. Johnson, and Richard Johnson
iii)	Linear algebra and learning from data by Gilbert Strang

<table>
<tr><td>Year, Program, Semester</td><td colspan="6">Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII</td></tr>
<tr><td>Course Code</td><td colspan="6">IKS 421</td></tr>
<tr><td>Course Category</td><td colspan="6">Indian Knowledge System</td></tr>
<tr><td>Course title</td><td colspan="6">Program Specific IKS</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td colspan="2">Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>02</td><td>-</td><td>-</td><td colspan="2">02</td><td>02</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">ISE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">30</td><td>70</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="6">Knowledge of Indian culture</td></tr>
<tr><td>Course Objectives</td><td colspan="6">The Course is aimed to-
1. Introduce fundamentals of Ancient Indian Educations to understand the pattern and purpose of studying vedas, vedangas, upangas, upveda, purana & Itihasa
2. To help students to trace, identify and develop the ancient knowledge systems.
3. To help to understand the apparently rational, verifiable and universal solution from ancient Indian knowledge system for the holistic development of physical, mental and spiritual wellbeing
4. To build in the learners a deep rooted pride in Indian knowledge, committed to universal human right, well-being and sustainable development.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">Upon completion of this course, student should be able to –
1. Explain the structure of Indian Knowledge Systems (IKS) including Vedas, Vedāṅgas, Upavedas, Puranas and Itihāsas.
2. Identify major Indian philosophical traditions and compare Vedic and Non-Vedic schools of thought.
3. Demonstrate understanding of contributions of IKS to mathematics, astronomy, science and technology.
4. Apply concepts such as number systems, measurement systems, and computational ideas from Sanskrit grammar in modern contexts.
5. Analyze Indian approaches to health, wellness, psychology, governance and ethics for holistic well-being and sustainable living.
6. Develop appreciation and pride in Indian heritage with sensitivity to universal human values and rights.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1				1	2			2		1			
CO 2	2	2				1	2			2		1			
CO 3	2	2	1	2	1		2			2		1			
CO 4	2	2	2	2	2					2		1			
CO 5		1				3	3	2	1	2	2	2			
CO6						3	3	2	1	2	2	2			

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction to IKS** Caturdaśa Vidyāsthānam, 64 Kalas, Shilpa Śāstra, Four Vedas, Vedāṅga, Indian Philosophical Systems, Vedic Schools of Philosophy (Sāṃkhya and Yoga, Nyaya and Vaiśeṣika, Pūrva-Mīmāṃsā and Vedānta), Non-Vedic schools of Philosophical Systems (Cārvāka, Buddhist, Jain), Puranas (Maha-puranas, Upa-Puranas and Sthala-Puranas), Itihasa (Ramayana, Mahabharata), Niti Sastras, Subhasitas	**5**
II	**Foundation concept for Science & Technology** Linguistics & Phonetics in Sanskrit (panini's), Computational concepts in Astadhyayi Importance of Verbs, Role of Sanskrit in Natural Language Processing, Number System and Units of Measurement, concept of zero and its importance, Large numbers & their representation, Place Value of Numerals, Decimal System, Measurements for time, distance and weight, Unique approaches to represent numbers (Bhūta Saṃkhya System, Kaṭapayādi System), Pingala and the Binary system, Knowledge Pyramid, Prameya – A Vaiśeṣikan approach to physical reality, constituents of the physical reality, Pramāṇa, Saṃśaya	**5**
III	**Indian Mathematics & Astronomy in IKS Indian Mathematics** Great Mathematicians and their contributions, Arithmetic Operations, Geometry (Sulba Sutras, Aryabhatiya-bhasya), value of π, Trigonometry, Algebra, Chandah Sastra of Pingala, Indian Astronomy, celestial coordinate system, Elements of the Indian Calendar Aryabhatiya and the Siddhantic Tradition Pancanga – The Indian Calendar System Astronomical Instruments (Yantras) Jantar Mantar or Raja Jai Singh Sawal.	**6**
IV	**Indian Science & Technology in IKS** Indian S & T Heritage ,sixty-four art forms and occupational skills (64 Kalas) Metals and Metalworking technology (Copper, Gold, Zinc, Mercury, Lead and Silver), Iron & Steel, Dyes and Painting Technology), Town & Planning Architecture in India, Temple Architecture, Vastu Sastra,	**6**
V	**Humanities & Social Sciences in IKS** Health, Wellness & Psychology, Ayurveda Sleep and Food, Role of water in wellbeing Yoga way of life Indian approach to Psychology, the Triguṇa System Body-Mind-Intellect-Consciousness Complex. Governance, Public Administration & Management reference to ramayana, Artha Sastra, Kauṭilyan State	**6**

Text/Reference Books	
i)	Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
ii)	Bhartiya Knowledge Systems by M.C. Bora, Khanna Publishing House.
iii)	Kapur K and Singh A. K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995.
iv)	Dr. Girish Nath Jha, Dr. Umesh Kumar Singh and Diwakar Mishra, Science 7 and Technology in Ancient Indian Texts, DK Print World limited,

Year, Program, Semester	Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII					
Course Code	**PSI 424**					
Course Category	**Project Seminar Internship**					
Course title	**Major Project-II**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	-	**-**	**02**	**02**		**01**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	-		**-**	**100**	**100**	**200**
Pre-requisites(if any)	Programming language knowledge, coding etc.					
Course Objectives	**The Course is aimed to-** 1. Help the Students to learn design and development of usable User Interface. 2. Guide to analyze and apply emerging technologies in development of a project. 3. Encourage Students to test the modules in Project. 4. Guide Students to demonstrate working of project.					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Implement proposed solution with the help of modern and emerging technologies and tools. 2. Design and develop usable User Interface. 3. Test the modules in Project. 4. Develop good communication skills and team work and present the findings of the study conducted in the preferred domain. 5. Demonstrate working of Project Report with a strong working knowledge of ethics and professional responsibility.					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	-	3	-	-	-	-	-	-	-	-	-	1
CO 2	2	3	2	2	3	-	-	-	-	-	-	-	-	-	3
CO 3	1	2	2	3	2	-	-	-	-	-	-	-	-	-	1
CO 4	1	-	2	-	2	-	-		2	3	2	-	-	-	1
CO 5	-	-	-	-	-	1	-	3	3	3	2	-	-	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Course Content

The group will continue to work on the project selected during the semester VII and submit the completed project work to the department at the end of semester VIII as mentioned below-

1. The workable project.
2. The project report in the bound journal complete in all respect with the following: -
   i) Problem specifications.
   ii) System definition – requirement analysis.
   iii) System design – dataflow diagrams, database design.
   iv) System implementation – algorithm, code documentation.
   v) Test results and test report.
   vi) In case of object oriented approach – appropriate process be followed.

Oral examination will be conducted by internal and external examiners as appointed by the University.

Note:

1. Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
2. Two mid-term evaluations should be done, which includes presentations and demos of the work done.
3. Care should be taken to avoid copying and outsourcing of the project work.

Year, Program, Semester	**Final Year B. Tech. (Computer Science and Technology) , Part IV, Semester VIII**					
Course Code	**VEC 421**					
Course Category	**Value Education Course**					
Course title	**Professional Ethics** (Through MOOC)					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	01	**-**	**-**	**01**		**01**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
	-		**-**	**50**	**--**	**50**
Pre-requisites(if any)	Knowledge of Communication and English					
Course Objectives	**The Course is aimed to-** 1. Understand the nature and scope of ethics. 2. Recognize ethical issues in engineering practice. 3. Apply ethical theories to real-world dilemmas. 4. Examine professional responsibilities and codes. 5. Develop moral reasoning and decision skills. 6. 6. Demonstrate ethical leadership and communication.					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Explain fundamental concepts of ethics. 2. Identify ethical challenges in engineering practice. 3. Apply moral reasoning to resolve dilemmas. 4. Interpret professional codes and responsibilities. 5. Evaluate ethical dimensions in real situations. 6. 6. Communicate ethical decisions effectively.					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	-	-	-	2	2	3	-	1	-	1	1	-	3
CO 2	2	2	-	1	-	3	2	3	-	-	-	1	2	2	-
CO 3	1	3	1	2	1	2	2	3	-	1	-	2	1	1	2
CO 4	1	2	2	2	-	2	2	3	-	1	-	2	2	-	-
CO 5	1	2	3	2	1	2	2	3	1	2	2	3	3	2	-
CO6	-	-	1	-	1	0	2	2	3	3	1	2	2	-	3

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	**Introduction to Ethics and Human Values** Definition, scope, and importance of ethics**,** Relationship between values, morals, and ethics**,** Human values and their role in engineering	2
II	**Professionalism and Engineering Ethics** Characteristics of a profession, Responsibilities of engineers toward society, employers, and peers, Role of professional bodies (e.g., IEEE, ASME, IEI) Review of basic	2
III	**Ethical Theories and Decision-Making Models** Utilitarianism, duty ethics, virtue ethics, Ethical decision-making framework, Case studies in engineering contexts	3
IV	**Workplace Ethics and Professional Conduct** Conflict of interest, confidentiality, intellectual property rights, Ethics in research and publication, Harassment, discrimination, and whistleblowing	3
V	**Ethics in Emerging Technologies** Ethical issues in AI, automation, biotechnology, and data security, Environmental ethics and sustainable responsibility, Globalization and cultural diversity in ethics	3
VI	**Ethical Leadership and Communication** Traits of ethical leaders, Team ethics and collaborative responsibility, Case presentations and role-play exercises	2

Text/Reference Books	
I.	Charles E. Harris Jr., Michael S. Pritchard, Michael J. Rabins (2018). Engineering Ethics: Concepts and Cases. Cengage Learning, Boston.
II.	Applied Multivariate Statistical Analysis by Dean W. Wichern, Richard A. Johnson, and Richard Johnson
III.	Fleddermann, C.B. (2011). Engineering Ethics. Pearson Education, New Jersey.
IV.	Martin, M.W., & Schinzinger, R. (2009). Introduction to Engineering Ethics. McGraw-Hill, New York.
V.	R. Subramanian (2015). Professional Ethics. Oxford University Press, New Delhi.

Year, Program, Semester	**Final Year B.Tech. (Computer Science and Technology) , Part IV, Semester VIII**					
Course Code	**PBL 421**					
Course Category	**Project Based Learning**					
Course title	**MDM based Mini Project**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**		**Total Credits**
	-	**-**	**-**	**-**		**02**
Evaluation Scheme	**ISE**		**ESE**	**IE**	**EE**	**Total**
				50	**50**	**100**
Pre-requisites(if any)	The knowledge of: Introduction to Internet of Things, Embedded Systems for IoT, IoT with Arduino, ESP & Raspberry Pi					
Course Objectives	**The Course is aimed to-** 1. Enable students to design and implement an IoT-based mini project. 2. Apply embedded systems, sensors, and communication technologies. 3. Develop problem-solving and analytical skills. 4. Encourage teamwork, documentation, and presentation skills. 5. 5. Familiarize students with project planning and execution methodologies.					
Course Outcomes	**Upon completion of this course, student should be able to –** 1. Identify and analyze a real-world problem suitable for an IoT solution. 2. Design system architecture using sensors, controllers, and communication modules. 3. Implement and test an IoT-based mini project. 4. Document project work and present technical findings effectively. 5. Write report, consider ethical issues in report writing / project management and express technical detail. 6. 6. Consider social, environmental, industrial issues					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	2	3					1	2	2			
CO 2	3	3	3	2	3					1	2	2			
CO 3	2	3	3	2	3					1	2	2			
CO 4	3	3	3	2	3					1	2	2			
CO 5	3	3	3	2	3	2		3		2	2	2			
CO6	2	2	1	2	2	2	1	1	3	1	2	2			

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Curriculum Content Group size and activities: 1) Mini project group size three/four students per every group. 2) Project idea should be proposed and finalized in consultation with guide. 3) Proposed weekly plan of the project should be finalized with guide. 4) Project work should be carried out in following steps a) Selection of project & problem definition. b) Paper design (Circuit design and flow chart of software) c) Simulation if required. d) Hardware implementation e) Software implementation (if required) f) Testing and calibration g) Report writing 5) Compulsory submission of mini project report by each group is a must. 6) Projects of two or more groups should not be same. 7) Seminar must be delivered after completion of project by each group preferably by using power point presentation. 8) Mini-project report must be submitted before/at the time of viva-voce. 9) Project should preferably address applications like: • Smart Home • Smart Agriculture • Smart Healthcare • Industrial IoT • Smart Energy / Environment Monitoring 10) Use of **open-source hardware/software** is encouraged.	
II	**Mini Project Report Format** 1. Title Page 2. Abstract 3. Introduction 4. Problem Definition & Objectives 5. Literature Survey 6. System Architecture 7. Hardware & Software Implementation 8. Results and Discussion 9. Conclusion and Future Scope 10. References 11. Appendix (Code, Diagrams, Screenshots)	
Reference Books		
i)	Articles from reputed journals, magazines, websites, real world problems, case studies	

Equivalence for the curriculum revision at B. Tech Computer Science and Technology
SEM – VII

Sr. No.	Final Year B. TechSemester VII Pre-revised syllabus	Final Year B. Tech Semester VII Revised syllabus	Remark
1	High Performance Computing	High Performance Computing	No change in the subject content
2	Advanced Database Management System	Advanced Database Management System	No change in the subject content
3	Distributed and Cloud Computing	------	Shifted to Sem VI
4	Advanced Network Engineering	Advanced Network Engineering	No Change in the subject content (Elective II)
5	Elective-I Project Management	------	Shifted to Sem VIII as Program Elective III
6	Elective-I Internet of Things	------	Shifted to Sem VIII as Program Elective III
7	Elective-I Data Science	------	Shifted to Sem VIII as Program Elective IV
8	Advanced Network Engineering Lab	------	Lab removed
9	Web Technology Lab-1	Web Technology Lab	Minor change in the subject content. Shifted to Sem VIII
10	Major Project Phase-I	Major Project – I	No change in the subject content. Only change in Title.
11	Internship - II	Industrial Internship	Shifted to Sem VIII
12	Professional Ethics	Professional Ethics	Shifted to Sem VIII through MOOC
13	------	Green Technology & Sustainability	Newly added VEC Credit course.
14	------	Open Elective- II (Cyber Laws)	Shifted from Sem VIII
15	------	Open Elective- II (IT for Engineers)	Shifted from Sem VIII
16	------	Open Elective- II (Data Mining and Warehousing)	Shifted from Sem VIII
17	------	Soft Computing	Shifted from Sem VIII
18	------	Soft Computing Lab	Shifted from Sem VIII
19	------	Elective II (Industrial Management)	Newly introduced.
20	------	Elective II (Information Security)	Shifted from Sem VIII
21	------	MDM based Industry Internship	Newly introduced as a part of MDM

*The MDM based industry Internship to be completed during winter/summer vacation slots 4th Semester onwards, before 7th Semester commencement.

SEM – VIII

Sr. No.	Final Year B. Tech Semester VIII Pre-revised syllabus	Final Year B. Tech Semester VIII Revised syllabus	Remark
1	Mobile Computing	------	Shifted to Elective I Sem VI
2	Information Security	------	Shifted to Elective II Sem VII
3	Soft Computing	------	Shifted to Sem VII
4	Elective-2 Big Data Technology	Program Elective-IV Big Data Technology (Through MOOC *)	Shifted to Program Elective IV Sem VIII
5	Elective-2 Data Mining and Warehousing	------	Shifted to Open Elective II Sem VII
6	Elective-2 Service Oriented Architecture	------	Course Removed
7	Elective-2 Image Processing	------	Shifted to Elective I Sem VI
8	Elective-3(Open Elective) Cyber Laws	------	Shifted to Open Elective II Sem VII
9	Elective-3(Open Elective) IT for Engineers	------	Shifted to Open Elective II Sem VII
10	Elective-3(Open Elective) E-Commerce	Program Elective-III E-Commerce (Through MOOC *)	Shifted to Program Elective III Sem VIII
11			
12	Soft Computing Lab	------	Shifted to Sem VII
13	Web Technology Lab-2	------	Lab removed
14	Major Project Phase-II	Major Project –II	No change in the subject content. Only change in Title.
15	Constitution of India	------	Course removed
16	------	Industrial Internship	Newly introduced.
17	------	Program Elective-III Deep Learning (Through MOOC *)	Newly introduced.
18	------	Program Elective-III Internet of Things (Through MOOC *)	Newly introduced.
19	------	Program Elective-III Project Management (Through MOOC *)	Taken from Sem VII as Program Elective-III
20	------	Program Elective-IV Data Science (Through MOOC *)	Newly introduced.
21	------	Program Elective-III Search Engine and Optimization	Newly introduced.

		(Through MOOC *)	
22	------	Program Specific IKS	Newly introduced (Online Mode)
23	------	Professional Ethics through MOOC	Mode is changed and made it as a Credit Course
24	------	MDM Based Mini Project*	Newly introduced as a part of MDM

*MDM based Mini Project to be completed during 4th Semester to 8th Semester.