

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

Scheme of Teaching & Examination of Bachelor of TechnologyVII

Semester B.Tech. (Industrial IOT)

Sr. No.	Course Code	Category	Course Name	Hours/ Week			Credits	Maximum Marks					Minimum Passing Marks	
								Theory		Practical		Total		
				L	T	P		Internal	University	Internal	University		Theory	Practical
1	BTechIOT701T	Professional core courses	Industrial IoT	3	0	0	3.00	30	70	-	-	100	45	
2	BTechIOT702T	Professional core courses	Natural Language Processing	3	0	0	3.00	30	70	-	-	100	45	
3	BTechIOT702P	Professional core courses	Natural Language Processing Lab	0	0	2	1.00			25	25	50		25
4	BTechIOT703T	Professional Elective Course	Elective- III	3	0	0	3.00	30	70	-	-	100	45	
5	BTechIOT703P	Professional Elective Course	Elective- III	0	0	2	1.00	--	--	25	25	50		25
6	BTechIOT704T	Open Elective	Open Elective- II	3	0	0	3.00	30	70	-	-	100	45	
7	BTechIOT705P	Project Work	Project	0	0	6	3.00	-	-	50	50	100		50
Total				12	0	10	17.00	120	280	100	100	600		

Elective III: 1. PLC & SCADA 2. Digital Image Processing 3. Wireless Sensor Networks 4. Cryptography & Network Security

Open Elective II : 1. Industrial Robotics 2. Intelligent Transport System 3. Data Compression and Encryption




RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

Scheme of Teaching & Examination of Bachelor of Technology

VIII Semester B.Tech . (Industrial IOT)

Sr. No.	Course Code	Category	Course Name	Hours/ Week			Credits	Maximum Marks					Minimum Passing Marks	
								Theory		Practical		Total		
				L	T	P		Internal	University	Internal	University		Theory	Practical
1	BTechIOT - 801T	Professional Elective Course	Elective IV	3	0	0	3.00	30	70	-	-	100	45	--
2	BTechIOT - 802T	Professional Elective Course	Elective V	3	0	0	3.00	30	70	-	-	100	45	--
3	BTechIOT - 803P	Project Work	Project	0	0	16	8.00	--	--	100	100	200	--	100
Total				6	0	16	14.00	60	140	100	100	400		

Elective IV: 1. Cyber forensic and cyber defense 2. Generative adversarial network 3. Biomedical Instrumentation 4. Computer Graphics for Virtual Reality

Elective V: 1. Deep Learning & Neural Network 2. Optical Circuits & Fibers 3. Cyber Crimes & Digital Forensics 4. Database Security and Access Control

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Industrial IOT**

Subject Code: **BTechIOT-701T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1.	To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application.
2.	Knowledge for the design and analysis of Industry 4.0 Systems for Electronics Engineering students.

Course Outcomes:

At the end of this course students will be able to:

CO1	Knowledge of theory related to Industrial IoT Systems
CO2	Ability to identify, formulate and solve engineering problems by using Industrial IoT.
CO3	Ability to solve real field problems by gained knowledge of Industrial applications with IoT capability.
CO4	Explain the fundamental concepts of Cyber-Physical Systems (CPS)
CO5	Describe the functions and applications of Industrial IoT.



Syllabus:

Unit	Contents	Hours
I	Introduction to Industrial IoT (IIoT) Systems: The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factories.	5
II	Implementation systems for IIoT: Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, WiFi, and LoRa Protocols and IoT Hub systems.	10
III	IIoT Data Monitoring & Control: IoT Gate way, IoT Edge Systems and It's Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology.	10
IV	Cyber Physical Systems: Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis	5
V	Industrial IoT- Applications: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.	5

Reference Books

1. Industry 4.0: The Industrial Internet of Things Alasdair Gilchrist Publications: press
2. The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics
Authors: Bartodziej, Christoph Jan Springer: Publication in the field of economic science.
3. Embedded System: Architecture, Programming and Design by Rajkamal, TMH3.
4. Dr. Ovidiu Vermesan, Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Natural Language Processing**

Subject Code: **BTechIOT-702T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	190

Course Objectives

1.	A basic understanding of mathematics.
2.	A basic Probability and Statistics.
3.	A basic Programming in any high-level language

Course Outcomes:

At the end of this course students will be able to:

CO1	Understand approaches to syntax and semantics in NLP.
CO2	To build the Natural language processing Models.
CO3	Apply current methods for statistical approaches to machine translation.
CO4	Analyze technique of summarization and classification on text.
CO5	Recognize the significance of pragmatics for natural language understanding.

Two handwritten signatures in blue ink are located at the bottom of the page. The first signature is a simple, stylized 'A' shape. The second signature is more complex, featuring a large loop and a vertical stroke.

Syllabus:

Unit	Contents	Hours
I	Introduction to Natural Language Processing (NLP): What is NLP and its motivations, Stages of language processing, Challenges of NLP, Applications of NLP.	6
II	NLP Models- Models for Sequential tagging, Simple N-gram models, Trigram model, Evaluation of language models. Syntax – Constituency Parsing, Dependency Parsing, POS tagging, Grammars for natural language, Tokenization and Sentence splitting, Computational Phonetics and Speech Processing.	8
III	Semantics: Lexical Semantics, WordNet and Frame Net, Distributional Semantics & Word-Space models, Logical approaches to sentence semantics.	8
IV	Text Summarization & Classification: Information Extraction, Text Summarization, Text Classification.	8
V	Sentiment Analysis: Sentiment Analysis and Opinion Mining, Named Entity Recognition, Semantic Textual Similarity.	8

Text Books

- 1) Dan Jurafsky and James Martin. Speech and Language Processing: An Introduction to Natural Language Processing.
- 2) Computational Linguistics and Speech Recognition. Prentice Hall, Second Edition, 2009.
- 3) Chris Manning and Hinrich Schütze. Foundations of Statistical Natural Language Processing. MIT Press, Cambridge, MA: May 1999.
- 4) Handbook-Computational-Linguistics-Language-Processing/dp/1118347188/ref=d_pd_vtp_scc1_1_1/135-0048941-

Reference Books

1. Siddiqui T., Tiwary U. S. Natural language processing and Information retrieval, OUP, 2008.
2. Bharati A., Sangal R., Chaitanya V. Natural language processing: a Paninian perspective, PHI, 2000.
3. The Oxford Handbook of Computational Linguistics (Oxford Handbooks) 1st Edition

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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: Natural Language Processing

Subject Code: BTechIOT-702P

Load	Credits [Pr]	College Assessment Marks	University Evaluation	Total Marks
2 Hrs/week	1	25	25	50

Sr.No	List of Practicals
1	Study of Natural Language Processing lab.
2.	Implement sentiment analysis technique for classifying the data in to positive, negative or neutral class
3	Use of NLP technique for text summarization
4	Implement simple machine translation from one language to another
5	Implement a code for aspect mining and topic modeling
6	Preprocessing of text (Tokenization, Filtration, Script Validation, Stop Word Removal, Stemming)
7	To implement POS tagging.
8	To implement chunking.
9	To implement name entity recognition.



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **PLC & SCADA**

Subject Code: **BTechIOT-703T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1.	To have the basic concept, components and programming of PLC for Automation.
2.	To implement ladder logics for various applications
3.	To understand SCADA displays and its applications.

Course Outcomes:

At the end of this course students will be able to:

CO1	Identify and understand components of PLCs for Automation
CO2	Select appropriate module as per application
CO3	Develop PLC Programming for given application.
CO4	Understand SCADA System.
CO5	Develop SCADA system for various applications.



Syllabus:

Unit	Contents	Hours
I	Introduction to PLC: Need and tools of Automation, Evolution of PLC ,Architecture-PLC Block diagram and working, Selection of PLC, Types of PLCs, Advantage, limitations and applications of PLCs, Networking of PLCs.	6
II	PLC Hardware: Input and Output Modules for PLC-working, description, wiring details, specifications, interfacing; Instruction sets for given operation, Ladder Programming ,Ladder logics for some applications.	8
III	PLC Programming and Applications: Programming Languages for PLCs, PLC programming standard IEC61131, Relay type Instructions-Timer, Counter, Arithmetic operation, Data handling instructions. PLC based applications as motor control, traffic light, etc.	8
IV	Introduction to SCADA: Application area of SCADA; Architecture-Elements, block diagram of SCADA; Types of SCADA; Features of SCADA, MTU, RTU Functions, Communications in SCADA, Applications of SCADA.	6
V	SCADA Interfacing and Applications: Interfacing of SCADA with PLC, Creating SCADA display, Application of SCADA for ON-OFF Lamp, Traffic light control, water level control, motor control, etc.	8

Reference Books:

1. Programmable Logic controllers and Industrial Automation: Madhuchhanda Mitra, Samarjit Sen Gupta, Penram International Publishing India Pvt. Ltd.
2. Supervisory Control and Data Acquisition: S.A. Boyar, ISA Publication.
3. Programmable Logic controllers: V. R. Jadhav, Khanna Publications.



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **PLC & SCADA**

Subject Code: **BTechIOT-703P**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
2 Hrs/week	1	25	25	50

Sr.No.	List of Practicals
1	Interfacing of lamp and button with PLC for ON/OFF operation
2	Multiple push button operation with delayed lamp for ON/OFF operation
3	To study Set and Reset operation of lamp
4	DOL Starter & Star Delta Starter operation by using PLC
5	PLC based temperature sensing using RTD
6	PLC based thermal ON/OFF control
7	PLC interfaced with SCADA and status read/ command transfer operation
8	Parameter reading of PLC in SCADA.
9	Alarm annunciation using SCADA
10	Reporting and Trending in SCADA System
11	Temperature sensing using SCADA

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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Digital Image Processing**

Subject Code: **BTechIOT-703T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1.	Provide the student with the fundamentals of digital image processing.
2.	Introduce the students to some advanced topics in digital image processing.
3.	Give the students a useful skill that would allow them to carry out further study in the field of Image processing

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain the fundamentals of Digital image processing .
CO2	Implement basic image processing algorithms in MATLAB.
CO3	Have the skills to further explore advanced topics of Digital Image Processing.
CO4	Make a positive professional contribution in the field of Digital Image Processing.
CO5	Describe core Segmentation Techniques.



Syllabus:

Unit	Contents	Hours
I	Digital Image Fundamentals: Components of Image Processing System, , Image Sensing and Acquisition, Image Sampling & Quantization, Spatial and Gray Level Resolution, Basic Relationships between Pixels. Statistical parameters, Measures and their significance, Mean, standard deviation, variance, SNR, PSNR etc.	8
II	Image Enhancement Enhancement in Spatial Domain: basic gray level transformations, histogram processing, equalization, Arithmetic and logical operations between images, Basics of spatial filtering, smoothening and sharpening spatial filters, Image Enhancement in frequency Domain: smoothening and sharpening frequency domain filters.	8
III	Image Transforms: 2D-DFT, FFT, DCT, the KL Transform, Walsh/Hadamard Transform, Haar Transform, slant Transform ,Basics of wavelet transform.	8
IV	Image Coding and Compression Image Coding Fundamentals: Image Compression Model, fundamentals-redundancy: coding, interpixel, psychovisual, fidelity criteria, Basic compression methods Error Free Compression -variable length, bit plane, LZW arithmetic Lossless Predictive, Lossy Compression-Lossy Predictive. Fundamentals of JPEG, MPEG, fractals.	8
V	Image Analysis Segmentation: Point, line, Hough Transform, Edge detection, Boundary detection and Thersholding, Region Based segmentation. Representation & Description: Boundary representation by chain codes, signature & skeleton Boundary descriptors, shape number, Fourier descriptors ,Basics of Regional descriptor, boundary representation by chain codes and B splines, Hough Transform.	8

Text Books

1. Gonzalez and Woods, "Digital Image Processing", Pearson Education,
2. 2. Arthur Weeks Jr., "Fundamentals of Digital Intake Processing", PHI.
3. 3.S Jayaraman, "Digital Image Processing",Tata McGraw Hill Publications.
4. 4. A. K. Jain, "Fundamentals of Digital Image Processing"; Pearson Education

Reference Book

1. Pratt William, "Digital Image Processing", John Wiley & Sons
- 2.Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Second Edition, Thomson Learning, 2001
3. Milan Sonka, Vaclav halvac , "Image Processing analysis & Machine Vision", Cenage Learning

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SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Digital Image Processing**

Subject Code: **BTechIOT-703P**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
2 Hrs/week	1	25	25	50

Sr.No.	List of Practicals
1	Simulation and Display of an Image, Negative of an Image(Binary & Gray Scale).
2	Implementation of Relationships between Pixels.
3	Implementation of Transformations of an Image.
4	Contrast stretching of a low contrast image, Histogram, and Histogram Equalization.
5	Display of bit planes of an Image.
6	Display of FFT(1-D & 2-D) of an image.
7	Computation of Mean, Standard Deviation, Correlation coefficient of the given Image.
8	Implementation of Image Smoothing Filters (Mean and Median filtering of an Image).
9	Implementation of image sharpening filters and Edge Detection using Gradient Filters.
10	Implementation of image restoring techniques.
11	Implementation of Image Intensity slicing technique for image enhancement.
12	Canny edge detection Algorithm.



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Wireless Sensor Network**

Subject Code: **HTechIOT-7034**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1.	Gain knowledge of wireless sensor network architectures and communications protocols .
2.	Explore the various technologies & Challenges in WSNs.
3.	Provide the students with the knowledge of network protocols and communication strategies.

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain the fundamental concepts of wireless sensor networks
CO2	Explain the basic principles of radio wave propagation
CO3	Describe the role and types of protocols in WSNs:
CO4	Explain the functions of key network protocols at different layers.
CO5	Explain the role and benefits of middleware in WSNs



Syllabus:

Unit	Contents	Hours
I	Introduction and Overview of Wireless Sensor Networks, Commercial and Scientific Applications of Wireless Sensor Networks, Basic Wireless Sensor Technology, Sensor Taxonomy, wireless network environment, wireless network trends.	8
II	Radio technology primer, Available wireless technologies, Wireless Sensors Networks Protocols, Physical Layer, Fundamentals of Medium Access Control Protocols for Wireless Sensor Networks, MAC protocols for WSN.	8
III	Sensors Network Protocols, Data dissemination and gathering, Routing Challenges and design issues in wireless sensor network, Routing strategies in WSN.	8
IV	Protocols, Transport Control Protocols for Wireless Sensors Networks, Traditional transport control protocol, transport protocol design issues, examples of existing transport control protocol, performance of TCP	5
V	Middleware for Sensor Networks, WSN middleware principles, Middleware architecture, existing middleware.	8

Text Books

1. "Wireless Sensor Networks: Technology, Protocols, and Applications", Kazem Sohraby, Daniel Minoli, Taieb Znati, Wiley Interscience Publication, 2007.
2. "Protocols and Architecture for Wireless Sensor Networks", H.Karl and A.Wiling, John Wiley & Sons, India,2012.
3. C. S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati , 'Wireless sensor networks',Edition: 2, Published by Springer, 2004 .

Reference Books

1. Morgan Kaufmann F. Zhao and L. Guibas, ' Wireless Sensor Networks',San Francisco, 2004.
2. "Computer Networks", Andrew Tanenbaum, 4th Edition, Pearson Education,2007



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: Wireless Sensor Network

Subject Code: BTechIOT-703P

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
2 Hrs/week	1	25	25	50

Sr.No.	List of Practical:
1	Introduction of Wireless sensor network applications and its simulation.
2	Network Simulator installation of wireless sensor network.
3	Write TCL script for transmission between mobile nodes.
4	Write TCL script for sensor nodes with different parameters.
5	Generate TCL script for udp and CBR traffic in WSN nodes.
6	Generate TCL script for TCP and CBR traffic in WSN nodes.
7	Implementation of routing protocol in NS2 for AODV protocol.
8	Implementation of routing protocol in NS2 for DSR protocol.
9	Implementation of routing protocol in NS2 for TORA protocol.
10	Study other wireless sensor network simulators.



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Cryptography & Network Security.**

Subject Code: **BTechIOT-703T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1.	To develop the student's ability to understand the concept of security goals in various applications and learn classical encryption techniques.
2.	To apply fundamental knowledge on cryptographic mathematics used in various symmetric and asymmetric key cryptography.
3.	To develop the student's ability to analyze the cryptographic algorithms.

Course Outcomes:

At the end of this course students will be able to:

CO1	To explain basics of Cryptography and Network Security and classify the symmetric encryption techniques.
CO2	Explain, analyze and implement the symmetric key algorithm for secure transmission of data.
CO3	To acquire fundamental knowledge of asymmetric key cryptography and analyze asymmetric key encryption algorithms .
CO4	Analyze the concept of message integrity and the algorithms for checking the integrity of data.
CO5	To describe various protocols for network security to protect against the threats in the networks



Syllabus:

Unit	Contents	Hours
I	Introduction: Attributes of security, OSI Security Architecture, Model for network security. Mathematics of cryptography: modular arithmetic, Euclidean and extended Euclidean algorithm. Classical encryption techniques: substitution techniques-Caesar cipher, Vigenere's ciphers, Hill ciphers, Playfair ciphers and transposition techniques.	8
II	Symmetric key cryptography: Block Cipher Principles, Data Encryption Standard (DES), Triple DES, Advanced Encryption Standard (AES), RC4, Key Distribution.	8
III	Asymmetric key cryptography: Euler's Totient Function, Fermat's and Euler's Theorem, Chinese Remainder Theorem, RSA, Diffie Hellman Key Exchange, ECC, Entity authentication: Digital signature.	8
IV	Message Integrity and authentication: Authentication Requirements and Functions, Hash Functions, MD5, Kerberos, Key Management, X.509 Digital Certificate format. Crypto currencies: History, A basic crypto currency, Creation of coins, Payments and double spending, Bit coin – Digital Signatures as Identities – eWallets – Personal Crypto security - Bit coin Mining	8
V	Network Security: PGP, SSL, Firewalls, IDS, Software Vulnerability: Phishing, Buffer Overflow, SQL Injection, Electronic Payment Types, IP Security: Architecture - Authentication header - Encapsulating security payloads – combining security associations - key management, Web Security.	8

Text Books:

1. William Stallings, "Cryptography and Network Security: Principles and Standards", Prentice Hall India, 7th Edition, 2017.
2. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, 2010.

Reference Books

1. Nina Godbole, "Information System Security", Wiley India Publication, 2008.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network security, private communication in a public world", Second Edition, Prentice Hall, 2002.
3. Christopher M. King, Curtis Patton and RSA press, "Security architecture, Design Deployment and Operations", McGraw Hill Publication, 2001.
4. Robert Bragge, Mark Rhodes, Heithstraggberg "Network Security, The Complete Reference", Tata McGraw Hill Publication, 2004.
5. Behrouz A. Forouzan, "Cryptography and Network Security", McGraw-Hill publication, 2nd Edition, 2010.

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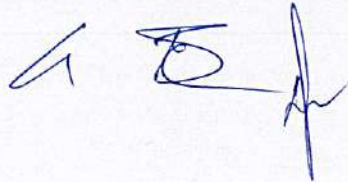
RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: Cryptography & Network Security.

Subject Code: BTechIOT-703P

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
2 Hrs/week	1	25	25	50

Sr.No.	List of Practicals
1	To study Various Cryptography Techniques.
2	Write a Program to Implement Caesar cipher.
3	Write a Program to Implement Vignere cipher.
4	Write a Program to Implement Playfair cipher.
5	Write a Program to Implement Diffie Hellman algorithm for key exchange.
6	Write a Program to Implement RSA algorithm
7	Write a Program to Implement DES(Data Encryption Standard) algorithm for data encryption.
8	Write a Program to Implement AES(Data Encryption Standard) algorithm for data encryption.
9	Write a Program to Implement Secure Hash Algorithm(SHA).
10	To Determine Organization's Firewall access control



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Industrial Robotics**

Subject Code: **BTechIOT-704T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1.	To develop proficiency in analyzing the motion and forces acting on robotic systems.
2.	Analyze the applications of robots in various industrial applications.
3.	To enhance problem-solving skills and critical thinking abilities in the field of Industrial robotics.

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain robot anatomy, classification, and applications of robots
CO2	Analyze and predict the motion of robot manipulators and mobile robots.
CO3	Derive and solve the equations of motion for robotic systems.
CO4	Apply mathematical models and algorithms to simulate and control robot dynamics.
CO5	Identify and address the challenges and limitations associated with robot dynamics.



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: Industrial Robotics

Subject Code: BTechIOT-704T

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1.	To develop proficiency in analyzing the motion and forces acting on robotic systems.
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Course Outcomes:

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CO3	Derive and solve the equations of motion for robotic systems.
CO4	Apply mathematical models and algorithms to simulate and control robot dynamics.
CO5	Identify and address the challenges and limitations associated with robot dynamics.



Syllabus:

Unit	Contents	Hours
I	Introduction to robotics, Brief History, Basic Concepts of Robotics such as Definition, Three laws, Elements of Robotic Systems i.e. Robot anatomy, DOF, Misunderstood devices etc., Classification of Robotic systems on the basis of various parameters such as work volume, type of drive, etc., Associated parameters i.e. resolution, accuracy, repeatability, dexterity, compliance, RCC device etc., Introduction to Principles & Strategies of Automation, Types & Levels of Automations, Need of automation, Industrial applications of robot.	8
II	Structure and Function of complete Robotics Work cell and its different components. Introduction to Cycle time and its importance. Methods to incorporate programming pendant. Understanding PLC and robot communication and HMI. Understanding the conveyor system and its communication with PLC.	8
III	Advanced material handling systems assisted by Industrial Robotics, automated guided vehicle systems, automated storage and retrieval systems (ASRS), bar code technology, radio frequency identification technology, Robot applications in various industries.	8
IV	Advanced Arc welding Industrial Robot, robotic peripheral equipment, servicing the robotic welding torch and wire feeding system, understanding of the robot and its control panel, safety knowledge, evaluations of weld cross-sections, inspection process and familiarity with tools.	8
V	Advanced assembly robot- automatic assembly applications, Introduction to automation and flexible manufacturing System, Introduction to micro and nano robotics.	8

Text Books:

1. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel and Nicholas G. Odrey, "Industrial Robotics", Tata Mc Graw Hill, 2010.

2. Mittal R K, Nagrath I J, "Robotics and control", Tata McGraw Hill, 2010.

Reference Books:

1. Theory Saced B. Niku, "An Introduction to Robotics: Analysis, systems and applications", Pearson Education, 2009.

2. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 1987.

2. Mikell P. Groover, "Automation, Production systems and Computer Integrated Manufacturing", Prentice Hall India Pvt. Ltd., 2011 .



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Intelligent Transport System**

Subject Code: **BTechIOT-704T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

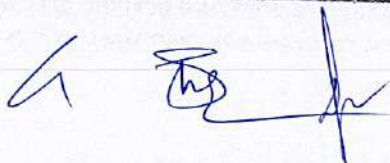
Course Objectives

1.	Gain foundational knowledge of ITS:
2.	Understand different ITS functionalities and services
3.	Critically evaluate current and emerging issues in ITS

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain ITS & ATIS.
CO2	Explain about Advanced Transportation Management System .
CO3	Explain about APTS, CVO, new technology and ETC .
CO4	Discuss about regional architecture, integration of infrastructure and operational planning.
CO5	Summarize about ITS issues in terms of various factors and emerging issues .



Syllabus:


Unit	Contents	Hours
I	Introduction to ITS, including where ITS fits; roles and responsibilities Advanced Traveller Information Systems (ATIS), including functionality; business models.	8
II	Advanced Transportation Management Systems (ATMS), including network operations; incident detection; congestion pricing, tolling, HOT lanes, example deployments.	8
III	Fleet-oriented ITS services, including Advanced Public Transportation Systems (APTS); BRT; Commercial Vehicle Operations (CVO); Intermodal Freight, including International Operations and Supply Chains. ITS and Technology, including automated highway systems (AHS); sensors, electronic toll collection (ETC); dedicated short range communication and standards.	8
IV	Regionally-scaled ITS deployment, including regional architecture; physical architecture; standards; developed vs. developing countries; ITS and strategic regional transportation planning; Integrating infrastructure and operations planning.	8
V	Critical ITS Issues, ITS and security; safety; human factors; privacy; sustainability; funding (as contrasted with conventional infrastructure); technology deployment/R &D/policy; Regional ITS planning and architecture presentation; the future of ITS; International ITS Programs . Case Studies: applications in bus transport, metro and highways; Emerging Issues.	8

Text Books:

1. Ghosh, S., Lee, T.S., "Intelligent Transportation Systems: New Principles and Architectures", CRC Press, 2000.
3. Mashrur A. Chowdhury, and Adel Sadek, "Fundamentals of Intelligent Transportation Systems Planning", Artech House, Inc., 2003.

REFERENCES:

1. Sussman, J.M., "Perspectives on Intelligent Transportation Systems", Springer, Berlin, 2010.
2. R.P Roess, E.S. Prassas, W.R. McShane., "Traffic Engineering", Pearson Educational International, 3rd Edition, 2004.



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: Data Compression & Encryption

Subject Code: BTechIOT-704T

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1.	To understand the different text compression technique.
2.	To study the various audio compression scheme
3.	To verify different video compression & image compression methods.
4.	To have the knowledge of various encryption technique.
5.	To acquire the information about different authentication technique

Course Outcomes:

At the end of this course students will be able to:

CO1	Describe varoius data compression techniques.
CO2	Explain varoius text compression techniques.
CO3	Explore varoius audio compression techniques.
CO4	Explain fundamental concepts of image and video compression:
CO5	Explore intrusion detection and prevention methods

Syllabus:

Unit	Contents	Hours
I	Data Compression Techniques: Loss less compression, Lossy compression, measure of performance, modeling and coding, different types of models, and coding techniques.	8
II	Text Compression: Minimum variance Huffman coding, extended Huffman coding, Adaptive Huffman coding, Arithmetic coding, Dictionary coding techniques, LZ 77, LZ 78, LZW.	8
III	Audio Compression: High quality digital audio, frequency and temporal masking, lossy sound compression, μ -law and A-law companding, and MP3 audio standard.	8
IV	Image and Video Compression: PCM, DPCM JPEG, JPEG -LS, and JPEG 2000 standards, Intra frame coding, motion estimation and compensation, introduction to MPEG -2 H-264 encoder and decoder.	8
V	System Security Malware: Intruders, Intrusion detection system, firewall design, antivirus, techniques, digital Immune systems, biometric authentication, and ethical hacking.	8

Text Books

1. Khalid Sayood, — Introduction to Data Compression, Morgan Kaufmann, 2000.
2. David Saloman, — Data Compression: The complete reference, Springer publication.
3. Behrouz Forouzan, — Cryptography and Network Security, Tata Mc Graw -Hill Education 2011.
4. Berard Menezes, — Network Security and Cryptography, learning publication Cengage.

Reference Books:

1. The Data Compression Book — Mark Nelson, BPB publication, 2nd Edition
2. Applied Cryptography — Bruce Schneier, John Wiley & Sons Inc. Publication, 2nd Edition
3. Cryptography & Network Security — Atul Kahate, Tata McGraw Hill, 2nd Edition
4. Cryptography and Network Security — Behrouz A. Forouzan, Special Indian Addition, SIE
5. Network Security & Cryptography — Bernard Menezes, Cengage Learning

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RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VII (C.B.C.S.)

BRANCH: Industrial IOT

Subject: Project

Subject Code: BTechIOT-705P

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
2 Hrs/week	3	30	50	100

10

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VIII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Cyber Forensic and Cyber defense**

Subject Code: **BTechIOT-801T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1	Discussion of general idea, structure and functions of Cyber and digital Forensics
2	Introduction to structure and functions of designing and executing Cyber defense strategies
3	Making students aware of Cyber Forensic tools.
4	Making students aware of Cyber Laws (International and Indian).
5	Making students aware of how to use different cyber defense strategies and tools.

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain and apply the basic concepts of Cyber Forensics and Cyber defense.
CO2	Illustrate Practical Use of various cyber forensic tools to investigate the cyber space.
CO3	Describe and apply various Cyber defense tools and strategies.
CO4	Explain the role of Law in Cyber defense and how to use it.
CO5	Explain and apply the basic concepts of Cyber Forensics and Cyber defense.



Syllabus:

Unit	Contents	Hours
I	Introduction: Cyber Crime- Overview, Internal and External Attacks, Online and offline attacks. Cybercrimes against Individuals – E-mail spoofing and other online frauds, Phishing and its forms, Spamming, Cyber defamation, Cyberstalking and harassment, Computer Sabotage, Pornographic offenses, Password Sniffing. Cybercrime against organization– Unauthorized access of computer, Denial-of service (DOS) attack.	7
II	Cyber Attacks: Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet.	7
III	Transaction Security: Securing a transaction: Encryption, digital signatures, virtual private networks, Internet fraud, Identity theft, Industrial, espionage, Cyber terrorism, Security hardware and software, intrusion detection for securing networks, Biometric-based security issues and challenges. PGP, Two factor authentication.	6
IV	Network Defense Tools: Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Statefull Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System, DMZ,	8
V	Cyber Crime and Law: Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal behaviour, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Chain of custody, Digital evidence Indian Penal Code, Criminal Procedure Code, Information Technology Act2000	8

Text Books:

- 1.Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina
- 2.Godbole and Sunit Belpure, Publication Wiley.

Reference Books

- 1.Information Security policies and procedures: A Practitioner's Reference Thomas R. Peltier Prentice Hall
- 2.Cyberlaw: the Law of the Internet Jonathan Rosenoer Springer-Verlag

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VIII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Biomedical Instrumentation**

Subject Code: **BTechIOT-801T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1	To introduce fundamentals of transducers as applicable to physiology
2	To explore the human body parameter measurements setups.
3	To make the students understand the basic concepts of forensic techniques.
4	To give basic ideas about how multimedia evidences are useful in crime investigation.

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain the physiology of biomedical system
CO2	Measure biomedical and physiological information
CO3	Discuss the application of Electronics in diagnostics and therapeutic area
CO4	Assess various non-electrical physiological parameters
CO5	Explain various medical imaging techniques and their applications



Syllabus:

Unit	Contents	Hours
I	Physiology and transducers Cell and its structure, Resting and Action Potential, Nervous system: Functional organization of the nervous system, Structure of nervous system, neurons, synapse, transmitters and neural communication, Cardio vascular system, respiratory system, Basic components of a biomedical system, Transducers, selection criteria, Piezo-electric, ultrasonic transducers, Temperature, measurements-Fiber optic temperature sensors.	5
II	Electro-Physiological measurements Electrodes: Limb electrodes, floating electrodes, pre-gelled disposable electrodes, Micro, needle and surface electrodes, Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers, Isolation amplifier. ECG, EEG, EMG, ERG, Lead systems and recording methods, Typical waveforms. Electrical safety in medical environment: shock hazards, leakage current-Instruments for checking safety parameters of biomedical equipment	10
III	Non-electrical parameter measurements Measurement of blood pressure, Cardiac output, Heart rate, Heart sound Pulmonary function measurements, spirometer, Photo Plethysmography, Body Plethysmography, Blood Gas analyzers: pH of blood, measurement of blood pCO ₂ , pO ₂ , finger-tip oximeter, ESR, GSR, measurements, Standard HL7	10
IV	Medical Imaging Radiographic and fluoroscopic techniques, X-rays, Computertomography, Mammography, MRI, fMRI, Ultrasonography, Endoscopy, Thermography, Different types of biotelemetry systems and patient monitoring	5
V	Assisting and therapeutic equipments Pacemakers, Defibrillators, Ventilators, Nerve and muscle stimulators, Diathermy, Heart Lung machine, Audiometers, Dialyzers, Lithotripsy	5

Textbooks & Reference Books

1. R.S.Khandpur, 'Hand Book of Bio-medical instrumentation', Tata Mc Graw Hill Publishing Co Ltd., 2003.
2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002/PHI.
3. J. Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
4. L.A. Geddes and L.E. Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VIII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Computer Graphics for Virtual Reality**

Subject Code: **BTechIOT-801T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1	To gain knowledge of fundamental parameters required for computer graphics like image, object, image representation, pixel etc.
3	To explore window, viewport, clipping .
4	To enhance 3D transformations applied on object & List different types of transformations & Projection techniques
5	To understand animation & process of animation & image processing terms like Image morphing & Warping

Course Outcomes:

At the end of this course students will be able to:

CO1	Describe the fundamental concepts of computer graphics.
CO2	Apply various 2D transformations.
CO3	Explain the concepts of 2D viewing and clipping.
CO4	Utilize 3D transformations and viewing principles.
CO5	Explain the fundamentals of animation techniques.



Syllabus:

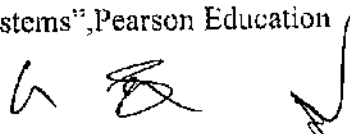
Unit	Contents	Hours
I	Introduction to Computer graphics and Output primitives. Define fundamental parameters required for computer graphics, applications of computer graphics B-Spline curves, Bezier curves, interpolation & fractals, scan conversion of line.	5
II	Area Filling and Two Dimensional Transformations. Inside/Outside Test, Scan line Polygon Fill Algorithm, Boundary Fill and Flood Fill algorithm. Basic Geometrical 2D transformations. Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation and Composite transformation.	10
III	Two Dimensional Viewing & Clipping Viewing Pipeline , View Coordinate reference frame, Window to view port transformation, Point clipping, Line clipping: Cohen Sutherland Algorithm, Liang Barsky algorithms, Polygon clipping: Sutherland and Hodgeman polygonclipping and Weiler Atherton. Text Clipping.	10
IV	Three Dimensional Transformation, Viewing and Projection. Three Dimensional transformations: Translation, Scaling, Rotations, Composite. Three Dimensional object representation: Polygon Surfaces, Tables, Meshes. Three Dimensional Viewing Pipeline , Viewing transformation , Projections : Parallel(Oblique and orthographic), Perspective (one Point)	5
V	Introduction to Animation Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping.	5

Textbooks

1. Donald Hearn and M.Pauline Baker, "Computer Graphics", Pearson Education.
2. R.K Maurya, "Computer Graphics with Virtual Reality", Wiley India.

Reference Books:

1. Grigore Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley.
2. Steven Harrington, "Computer Graphics", McGraw Hill.
3. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill.
4. Vince, "Virtual Reality Systems", Pearson Education



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VIII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Deep Learning & Neural Network**

Subject Code: **BTechIOT-802T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1	To introduce basic deep learning algorithms.
2	To understand real world problem which will be solved by deep learning methods.
3	To identify deep learning techniques suitable for a real world problem.

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain basic of deep learning algorithms.
CO2	Represent feed forward Neural Network
CO3	Evaluate the performance of different deep learning models with respect to the optimization, bias variance trade-off, over fitting and under fitting.
CO4	Apply the convolution networks in context with real world problem solving.
CO5	Apply recurrent neural networks in context with real world problem solving.

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Syllabus:

Unit	Contents	Hours
I	UNIT I - Basic of Deep Learning History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm and Convergence, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Feed forward Neural Networks.	5
II	Unit II -Training of feed forward Neural Network - Representation Power of Feed forward Neural Networks, Training of feed forward neural network, Gradient Descent, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam.	10
III	Unit III - Optimization Algorithm - Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Activation Function and Initialization Methods: Sigmoid, Tanh, Relu, Xavier and He initialization, Regularization: Bias and variance, Overfitting, Hyperparameters tuning, L1 and L2 regularization, Data Augmentation and early stopping, Parameter sharing and tying.	10
IV	Unit IV - Convolution Neural Network (CNN) - Convolutional operation, Pooling, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet. Visualizing Convolutional Neural Networks, Guided Backpropagation.	5
V	Unit V - Recurrent Neural Network (RNN) - Recurrent Neural Networks, Backpropagation through Time (BPTT), Vanishing and Exploding Gradients, Long Short Term Memory (LSTM) Cells, Gated Recurrent Units (GRUs).	5

Text Books:

- 1.Sandro Skansi, Introduction to Deep Learning, Springer.
- 2.Charu C., Aggarwal. Neural Networks and Deep Learning: A Textbook. Springer. 2019.
- 3.Ian Goodfellow, Yoshua Bengio and Aaron Courville. Deep Learning. An MIT Press book. 2016.
- 4.Dr. S Lovelyn Rose, Dr. L Ashok Kumar, Dr.D Karthika Renuka, Deep Learning using Python, Willey Publication.

Reference Books

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. A. Ravindran, K. M. Ragsdell



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VIII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Optical Circuits & Fibers**

Subject Code: **BTechIOT-802T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1	To understand optical fiber technology to sophisticated modern telecommunication systems.
2	To understand the fundamental behavior of the individual optical components, describes their interactions with other devices in an optical fiber.
3	To measure & analyze different measurements, parameters & properties of optical fiber.

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain the basic elements of optical fiber.
CO2	Explain the different kinds of losses, signal distortion in optical wave guides & other signal degradation factors.
CO3	Classify various optical source materials, LED structures, LASER diodes.
CO4	Explain the fiber optic receivers such as PIN, APD diodes, receiver operation & performance.
CO5	Explain the operational principal of WDM, SONET, measurement of attenuation, dispersion, refractive index profile in optical fibers.

Syllabus:

Unit	Contents	Hours
I	OVERVIEW OF OPTICAL FIBER COMMUNICATION: Introduction, advantages, disadvantages and applications of optical fiber communication, Ray theory, classification of Optical Fibers	5
II	TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS: Fiber manufacturing & Fiber materials, manufacturing methods, Attenuation, Absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion.	10
III	OPTICAL SOURCES AND COUPLERS & CONNECTORS OF FIBER: Introduction, fiber alignment and joint loss, singlemode fiber joints, fibersplices, fiberconnectors and fiber couplers. Optical sources: LED's, LASER diodes.	8
IV	OPTICAL DETECTORS AND RECEIVER: Photo detectors, Photo detector noise, Response time, comparison of photo detectors Optical Receiver Operation, receiver sensitivity, quantum limit, coherent detection, burst mode receiver operation, Analog receivers	6
V	ANALOG AND DIGITAL LINKS: Analog links –overview of analog links, CNR, multichannel transmission techniques, Digital links –point-to-point links, System considerations, link power budget, rise time budget, transmission distance for single mode links.	5

TEXT BOOKS:

1. "Optical Fiber Communication", Gerd Keiser, 3rd Ed., McGraw Hill,
2. "Optical Fiber Communications", John M. Senior, Pearson Education. 3rd Impression, 2007.

REFERENCE BOOK:

1. Fiber Optic Communication -Joseph C Palais: 4th Edition, Pearson Education.
2. "TextBook on Optical Fiber Communication & its Application", S.C. Gupta, PHI Publications
3. "Optical Communication & Networks", M.N. Bandopadhyay, PHI Publications



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VIII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: **Cyber Crimes & Digital Forensics**

Subject Code: **BTechIOT-802T**

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1	Describe cyber Crime and Digital Forensic concepts
2	Determine various digital forensic Operandi and motive behind cyber attacks
3	Demonstrate various forensic tools to investigate the cybercrime and to identify the digital pieces of evidence
4	To correctly define and cite appropriate instances for the application of computer forensics Correctly collect and analyze computer forensic evidence
5	Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics

Course Outcomes:

At the end of this course students will be able to:

CO1	Describe Forensic science and Digital Forensic concepts
CO2	Determine various digital forensic Operandi and motive behind cyber attacks
CO3	Interpret the cyber pieces of evidence, Digital forensic process model and their legal perspective.
CO4	Demonstrate various forensic tools to investigate the cybercrime and to identify the digital pieces of evidence.
CO5	Analyze the digital evidence used to commit cyber offences



Syllabus:

Unit	Contents	Hours
I	Cyber Crime and computer crime Introduction to Digital Forensics, Definition and types of cybercrimes, Use of Computer Forensics in Law Enforcement, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists, Types of Business Computer Forensic Technology. Types of Law Enforcement-Computer Forensic Technology	5
II	Computer Forensics Evidence and capture: Data Recovery Defined-Data Back-up and Recovery-The Role of Back -up in Data Recovery-The Data -Recovery Solution. Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options-Obstacles-Types of Evidence-The Rules of Evidence-Volatile Evidence-General Procedure-Collection and Archiving-Methods of Collections-Art facts-Collection Steps -Controlling Contamination: The chain of custody.	10
III	Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene-Computer Evidence processing steps-Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication -Practical Consideration-Practical Implementation	10
IV	Computer forensic analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions Network Forensics: Network forensic overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project. Processing crime at incident scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.	5
V	Working with windows and dos systems: understanding file systems, exploring Microsoft file structures examining NTFS disks, understanding whole disk encryption, windows registry, Microsoft startup tasks, MS Dos startup tasks, virtual machines.	5



Textbooks:

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning.

- 3.The basics of digital Forensics (Latest Edition) –The primer for getting started in digital forensics by John Sammons –Elsevier Syngress Imprint.
- 4.Cybersecurity –Understanding of cybercrimes, computer forensics and Legal perspectives by Nina Godbole and Sunit Belapure –Wiley India Publication.
- 5.Practical Digital Forensics –Richard Boddington [PACKT] Publication, Open source community.

Referencebooks:

1. Real Digital Forensics by Keith j.Jones, Richard Bejtlich,Curtis W.Rose ,Addison-Wesley Pearson Education.
- 2.Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brain Jenkinson,Springer International edition .
- 3.Homeland Security ,Techniques & Technologies by Jesus Mena,Firewall Media.
- 4.Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M.Slade ,TMH 2005.
- 5.Windows Forensics by chad Steel,Wiley India Edition.



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VIII (C.B.C.S.)

BRANCH: Industrial IOT

Subject: Database security and Access Control

Subject Code: BTechIOT-802T

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
3T Hrs/week	3	30	70	100

Course Objectives

1	Explore the origins of NoSQL databases and the characteristics that distinguish them from traditional relational database management systems.
2	Discuss the criteria that decision makers should consider when choosing between relational and non-relational databases and techniques for selecting the NoSQL database that best addresses specific use cases.

Course Outcomes:

At the end of this course students will be able to:

CO1	Explain the detailed architecture, Database properties and storage requirements
CO2	Differentiate and identify right database models for real time applications
CO3	Outline Key value architecture and characteristics
CO4	Design Schema and implement CRUD operations, distributed data operations
CO5	Compare data ware housing schemas and implement various column store internals



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FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE
SEMESTER: VIII (C.B.C.S.)
BRANCH: Industrial IOT

Subject: Project

Subject Code: BTechIOT-803P

Load [Th+Tu]	Credits [Th]	College Assessment Marks	University Evaluation	Total Marks
6 Hrs/week	16	100	100	200



Syllabus:

Unit	Contents	Hours
I	Introduction to NoSQL concepts: Data base revolutions: First generation, second generation, third generation, Managing Transactions and Data Integrity, ACID and BASE for reliable database transactions, Speeding performance by strategic use of RAM, SSD, and disk, Achieving horizontal scalability with Data base sharding, Brewers CAP theorem.	5
II	NoSQL data architecture patterns: NoSQL Data model: Aggregate Models- Document Data Model- Key-Value Data Model Columnar Data Model, GraphBased Data Model Graph Data Model, NoSQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication to scale reads, Database distributed queries to Data nodes	10
III	Key value data stores: From array to key value databases, Essential features of key value Databases, Properties of keys, Characteristics of Values, Key- Value Database Data Modelling Terms, Key-Value Architecture and implementation Terms, Designing Structured Values, Limitations of Key Value Databases, Design Patterns for Key-Value Databases, Case Study: Key-Value Databases for Mobile Application Configuration	10
IV	Document oriented database: Document, Collection, Naming, CRUD operation, querying, indexing, Replication, Sharding, Consistency Implementation: Distributed consistency, Eventual Consistency, Capped Collection, Case studies: document oriented database: Mongo DB and/or Cassandra	5
V	Data modelling with graph: Comparison of Relational and Graph Modeling, Property Graph Model Graph Analytics: Link analysis algorithm- Web as a graph, Page Rank- Markov chain, page rank computation, Topic specific pagerank (Page Ranking Computation techniques: iterative processing, Random walk distribution Querying Graphs: Introduction to Cypher, case study: Building a Graph Database Application- community detection	5

Text Books

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, An introduction to Information Retrieval, Cambridge University Press
2. Daniel Abadi, Peter Boncz and Stavros Harizopoulos, The Design and Implementation of Modern Column-Oriented Database Systems, Now Publishers.

Reference Books

1. Guy Harrison, Next Generation Database: NoSQL and big data, Apress.