

RCC INSTITUTE OF INFORMATION TECHNOLOGY
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A UNIT OF RCC INSTITUTE OF TECHNOLOGY AN AUTONOMOUS
SOCIETY OF DEPARTMENT OF HIGHER EDUCATION, GOVT. OF WEST
BENGAL



COURSE BOOKLET
B.TECH, 4TH YEAR
2018-2022 BATCH

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
RCC INSTITUTE OF INFORMATION TECHNOLOGY
CANAL SOUTH ROAD, BELIAGHATA
KOLKATA - 700 015, WEST BENGAL, INDIA

This revised version of Course booklet is being published in accordance with Outcome Based Education (OBE) policy approved by Program Assessment Committee (PAC), Departmental Advisory Board(DAB), Department of Electronics and Communication Engineering (ECE)

Department of Electronics and Communication Engineering

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All faculty members associated with Department of Electronics and Communication Engineering, RCCIIT, concerned faculty members of Basic Science and Humanities and the honorable members of DAB, Electronics and Communication Engineering of RCCIIT are acknowledged for their timely support and relevant inputs towards the preparation of this booklet.

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About Department:

Department of Electronics and Communication Engineering is successfully running since 2006 with an intake of 60 seats. In 2010 intake increased to 120; from 2012 the department also started 2 years full time PG program in Tele Communication to make a significant contribution in the field of higher studies.

The Department used to organize seminars, development programs, and workshops for faculties, staffs and students in support of incessant development. A pool of competent faculty member of the Department constantly motivates the students to get placed by means of job, research and higher studies; and the outcomes reflect in the achievement.

The pass out students of the ECE Department now associated with pioneer Institutions like North Dakota State University (USA), University of Regina (Canada), College of Medicine Swansea University (UK), University of Illinois, Chicago (USA), University of Buffalo (USA), Texas Tech University, different IITs (Kharagpur, Kanpur, Roorkee, Guwahati), IIM (Kozhikode), IEST, ISM, Jadavpur University etc. Moreover the students of this Department are also allied with prestigious organizations like BSNL, ECIL, WBSEB, AAI, INTERRA SYSTEM, TCS, CTS, INFOSYS, IBM, ACCENTURE, TECH MAHINDRA, ERICSSON L&T etc. The Department is also involved actively in the frontier research, corroborated by a significant number of research papers in various national and international journals and conferences.

Vision of the Department

Graduates of this department will be part of global academia/industry through sincere professional commitments, research and innovations by ethically considering environmental impacts and societal benefits in the multidisciplinary culture for sustainable development of civilization throughout their career.

Mission of the Department

Mission No.	Mission Statements
M1	Be able to develop sustainable solutions of problems related to electronics and communication engineering as individual or part of a team maintaining professional ethics and environmental aspects.
M2	Be competent to perceive higher studies through research, innovation and managerial skills for integrated life-long learning..
M3	Create leadership qualities through learning beyond classroom, effective communication, inter-personal skill, technological development and innovation for benefit of society

Program Outcome (POs) of the Department

Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEOs) of the Department

PEO No.	Program Educational Objectives Statements
PEO1	Be competent to solve electronics and communication engineering related problems by applying fundamental principles of natural sciences, domain knowledge using modern tools, techniques and inter-personal skills for early employment in industry/academia.
PEO2	Be part of diverse multinational sectors by continuously interpreting global professional development through innovative research and self-study in subject domain and allied fields as a part of life-long learning.
PEO3	Be qualified to construct professional work using acquired domain knowledge as individual or team-member in global environment pertaining to electronics fulfilling ethical, societal and environmental issues.

Program Specific Outcomes (PSOs)

PSO No.	Program Specific Outcome(PSOs) Statements
PSO1	Investigate the design/development of intra and interdisciplinary complex problems/systems through acquired technical knowledge in the field of electronics and communication engineering using state-of-the-art hardware and software tools.
PSO2	Estimate every multidisciplinary project in the light of professional ethics for societal welfare prior to implementation and keeping the environment safe through teamwork or individual means.
PSO3	Invent novel technical solutions applicable for academia/industry relevant to electronics and communication engineering through complex engineering activities maintaining specified constraints with possible life-long impact.

Correlation between PEOs and Mission of the Department of Electronics & Communication Engineering, RCCIIT

PEO No.	PEO statements	M1	M2	M3
PEO1	Be competent to solve electronics and communication engineering related problems by applying fundamental principles of natural sciences, domain knowledge using modern tools, techniques and inter-personal skills for early employment in industry/academia.	3	2	2
PEO2	Be part of diverse multinational sectors by continuously interpreting global professional development through innovative research and self-study in subject domain and allied fields as a part of life-long learning.	1	3	3
PEO3	Be qualified to construct professional work using acquired domain knowledge as individual or team-member in global environment pertaining to electronics fulfilling ethical, societal and environmental issues.	2	2	3

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Odd Semester(VII)

Sl.No.	Paper Code	Paper Name	Credit
1.	PE-EC701	Program Elective-3	3
2.	PE-EC702	Program Elective-4	3
3.	PE-EC703	Program Elective-5	3
4.	OE-EC704	Open Elective-3	3
5.	HS-HU701	Principles of Management	2
6.	EC781	Industrial Training	1
7.	EC782	Project Stage-I	4

Even Semester(VIII)

Sl.No.	Paper Code	Paper Name	Credit
1.	PE-EC801	Program Elective-6	3
2.	PE-EC-802	Program elective-7	3
3.	OE-EC803	Open Elective -4	3
4.	OE-EC804	Open Elective -5	3
5.	EC881	Project Stage-II	7.5
6.	EC882	Grand Viva	1.5

Odd Semester(VII) Articulation Matrix

Paper Code	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO1 2	PSO 1	PSO 2	PSO 3
PE-EC701B	1.8	1.6	2	1.16	2	0	0	0	0	0	0	0	2	-	2.5
PE-EC702B	3.00	3.00	2.33	2.67	2.67	2.50	2.00	0	0	0	0	3.00	3	2	1
PE-EC703B	2.67	2.50	2.50	2.20	2.75	0	2.50	0	0	0	0	2.17	3.00	1.00	1.67
OE-EC704	2.67	2.5	2.25	1.67	2	1.67	2	0	0	0	0	2.67	1.5	2	1.67
HS-HU701	3.00	3.00	3.00	0	3.00	0	1	0	1	0	0	0	1	1	0
EC781	2.00	2.67	1.50	1.75	1.67	2.33	3.00	1.50	2.00	1.67	1.75	2.00	2.00	1.50	1.60
EC782	3	3.00	2.00	1.00	2.50	2.00	2.00	2.5	2.75	3	3	2.60	3	2.8	2.67

Even Semester(VIII) Articulation Matrix

Paper Code	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
PE-EC801B	3.00	2.50	2.17	1.33	2.00	1.00	1.00	-	-	-	-	2.00	2.50	1.00	2.00
PE-EC801C	3	3	2.66	1	2	1	1	0	0	0	0	2.66	2.66	1	1.83
PE-EC-802B	3	2.66	2.75	2.66	-	2		-	-	1		3	3	2	2
OE-EC803A	3.00	3.00	2.33	2.67	2.83	2.67	2.6	0	0	0	3	3.00	3	2.17	2.33
OE-EC803C	2.67	1.83	2.00	1.75	2.50	1.67	1.25	2.17	1.00	0.00	0.00	2.00	2.00	2.67	1.67
OE-EC804C	3.00	3.00	3.00	0	3.00	0	1	0	1	0	0	0	1	1	0
EC881	3	3.00	2.50	3.00	2.50	0	0	3	3	3	3	2.83	3	3.00	2.50
EC882	2	2.75	2.4	3	2.5	2	2	2	2	2	0	3	2.66	2	3

Course Title: Satellite Communication	Code: PE-EC701B
Type Of Course: Theory	Course Designation: Program Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks Attendance : 5 Marks	Final Exam: 70 Marks
Writer: (Course Coordinator)	Approved by HoD (Convenor of DAB)

Pre-requisites: Fundamental knowledge on Wireless Communication

Course Objective (COB's) of Satellite Communication:

1. To enable the student to become familiar with satellites and satellite services.
2. Study of satellite orbits and related aspects.
3. Study of earth segment and space segment components
4. Study of satellite access technique by various users.

Course Outcome (CO's) of Satellite Communication:

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
EC701B.CO1	Illustrate the basic concepts and techniques of Satellite communication and frequency allocations to outline the basic concepts and techniques of Satellite communication	K2: Illustrate
EC701B.CO2	Determination OF Orbital Parameters and other orbital attributes to describe the motion of satellite in the orbit.	K5: Determination
EC701B.CO3	Describe satellite subsystems and their deployment issues to Study the importance of earth segment and space segment components	k5: Describe
EC701B.CO4	List different orbital issues associated with Satellite communication to to list different types of natural impairments associated in Satellite Communication	K1: List
EC701B.CO5	Design important link power budget Equations for satellite communication to evaluate link performance studies for a given situation	K6: Design
EC701B.CO6	Explain satellite access techniques to emphasizes intuitive understanding and practical implementations of the theoretical concepts	K5: Evaluating

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	2								2	-	2
CO2	2	1	2	1	2								2	-	2
CO3	2	2	2	1	2								2	-	3
CO4				2									2	-	3
CO5	2	1	2	1	2								2	-	2
CO6	1	2	2	1	2								2	-	3
AVERAGE	1.8	1.6	2	1.16	2	0	0	0	0	0	0	0	2	-	2.5

University Syllabus:

Unit	Content	Hrs/Unit	Related COs
1.	Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication	2	CO1
2.	Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day	3	CO2
3.	Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.	4	CO3
4.	Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.	1	CO4
5.	Satellite link budget :Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.	5	CO5
6.	Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.	6	CO6

RESOURCES:

Text Books :

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002
2. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill, 2009

Reference Books (R):

1. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009
2. B.N. Agrawal, Design of Geosynchronous Spacecraft, Prentice- Hall, 1986.

E-Resource (Website link/E-book/Journal/MOOC etc.) (E):

1. Study materials
2. Videos Lectures of NPTEL:
<https://www.youtube.com/watch?v=dt4Ce8gQPns&list=PLAnjLC20C-XQnoowCtt-67WmyxoQPu2Fi>

Course Title: Digital Image and Video Processing	Code: EC702B
Type of Course: Theory	Course Designation: Open Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 30 Marks End Semester Exam: 70 marks	
Writer: (Course Coordinators)	Approved by HoD (Convenor of DAB)

Pre-requisites: Digital Signal Processing, Signals and Systems, Digital Communication

Course Outcomes (CO's) of Digital Image and Video Processing

On completion of the course students will be able to

CO#	CO Statement	Bloom's Revised knowledge Level
CO1	Understand human visual system and importance of adequate sampling frequencies to representat digital images	K2: Understand
CO2	Apply signal processing techniques for image enhancement in spatial and frequency domain.	K3: Apply
CO3	Analyze images in the frequency domain using multiresolution analysis.	K4: Analyze
CO4	Evaluate different image segmentation methodologies to classify and identify different objects present in an image	K5: Evaluate
CO5	Categorize various lossy and lossless image compression techniques to reduce redundancies	K4: Analyze
CO6	Understand the fundamentals of video coding to interpret real life appication in object detection and tracking	K2: Understand

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	1	2	1	-	-	-	-	3	2	1	1
CO2	3	3	2	3	3	3	2	-	-	-	-	3	3	2	1
CO3	3	3	2	2	3	1	-	-	-	-		3	3	1	0

CO4	3	3	3	3	3	3	2	-	-	-	-	3	3	2	1
CO5	3	3	3	3	3	3	3	-	-	-	-	3	3	2	1
CO6	3	3	3	3	3	3	2	-	-	-	-	3	3	2	1
AV G	3.0 0	3.0 0	2.3 3	2.6 7	2.6 7	2.5 0	2.0 0	0	0	0	0	3.00	3	2	1

University Syllabus:

Unit	Content	Hrs/Unit
1: Digital Image Fundamentals	Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels - neighborhood, adjacency, connectivity, distance measures.	4
2. Image Enhancements and Filtering	Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters - linear and order-statistics, pixel-domain sharpening filters - first and second derivative, two-dimensional DFT and its inverse, frequency domain filters -low-pass and high-pass. .	8
3Color Image Processing	Color models-RGB, YUV, HSI; Color transformations- formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.	5
4: Image Segmentation	Detection of discontinuities, edge linking and boundary detection, thresholding - global and adaptive, region-based segmentation.	6
5. Wavelets and Multi-resolution image processing	Uncertainty principles of FourierTransform, Timefrequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Subband filter banks, wavelet packets.	5
6. Image Compression	Redundancy-inter-pixel and psycho-visual; Lossless compression - predictive, entropy; Lossy compression-predictive and transform coding; Discrete Cosine Transform; Still image compression standards-JPEG and JPEG-2000.	6
7. Fundamentals of Video Coding	Inter-frame redundancy, motion estimation techniques - full-search, fast search strategies, forward and backward motion prediction, frame classification - I, P and B; Video sequence hierarchy-Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards - MPEG and H.26X.	5
8. Video Segmentation	Temporal segmentation-shot boundary detection, hard-cutsand soft-cuts; spatial segmentation-motion-based; Video object detection and tracking.	3

RESOURCES:

1. R.C Gonzalez and R. Woods :-Digital Image Processing, (Indian reprint: Pearson publication, 2001)
2. Anil K. Jain :- Digital Image Processing (Prentice-Hall, India)
3. W. K. Pratt :- Digital Image Processing, - 2nd Edition, (John Wiley & Sons).
4. B. Chanda & D. Dutta Majumder, Digital Image Processing and Analysis, (Prentice-Hall, India)
5. M. A. Sid-Ahmed :- Image Processing- Theory, Algorithms & Architecture, (McGraw-Hill).
6. Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015
7. NPTEL-SAWAYAM : Digital Image Processing by Prof. Prabir Kr. Biswas(IIT, Kharagpur) (https://onlinecourses.nptel.ac.in/noc19_ee55/announcements?force=true)

Course Title: Wireless Sensor Networks	Code: PE-EC703B
Type of Course: Theory	Course Designation: Compulsory
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks Attendance : 5 Marks	Final Exam: 70 Marks
Writer: (Course Coordinators)	Approved by HoD (Convenor of DAB)

Pre-requisites: Fundamental knowledge on sensor and communications

Course Objective (COb's) of Wireless sensor networks:

EC703B:COb1:Understand and explain common wireless sensor node architectures

EC703B:COb2:Be able to carry out simple analysis and planning of WSNs

EC703B:COb3:Demonstrate knowledge of MAC protocols developed for WSN

EC703B:COb4:Demonstrate knowledge of routing protocols developed for WSN

EC703B:COb5:Understand and explain mobile data-centric networking principles

EC703B:COb6:Be familiar with WSN standards

Course Outcomes (CO's) of Control Lab

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
EC703B.CO1	CO1: Define the Wireless Sensor Networks, its advantages, constraints and challenges for proper applications of sensor networks.	K1: Remembering
EC703B.CO2	CO2: Analyze the different types of protocols to overcome challenges in WSNs.	K2: Understanding
EC703B.CO3	CO3: Importance of data dissemination and data fusion for large sensor network.	K5: Evaluating
EC703B.CO4	CO4: Justify the design principles for WSNs with the concepts of gateway.	K5: Evaluating
EC703B.CO5	CO5: Construct single node WSN architecture to overcome the design constraints.	K3: Applying
EC703B.CO6	CO6: Apply the different operating system in WSNs to communicate with the users.	K3: Applying

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	1	-	-	-	-	-	-	-	2	3	-	2
CO2	2	2	-	-	-	-	-	-	-	-	-	1	3	-	1
CO3	3	3	3	3	3	-	3	-	-	-	-	3	3	1	2
CO4	3	-	-	2	2	-	2	-	-	-	-	2	3	-	1
CO5	3	-	2	2	3	-	2	-	-	-	-	2	3	1	2
CO6	3	3	-	3	3	-	3	-	-	-	-	3	3	-	2
AVG	2.67	2.50	2.50	2.20	2.75	0	2.50	0	0	0	0	2.17	3.00	1.00	1.67

University Syllabus:

Module	Content	Hrs/Unit
Module 1: Introduction	Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor [4L] Networks, Applications of Sensor Networks, Types of wireless sensor networks [4L]	8
Module 2: Ad-hoc networks	Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks [4L] Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks [4L]	8
Module 3: Routing Protocols	Routing protocols, MAC protocols: Classifications of MAC protocols, S-MAC protocol, B-MAC protocol, IEEE802.15.4 standard and ZigBee. [6L] Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols. [4L]	10
Module 4: Gateway concepts	Design Principles for WSNs, Gateway Concepts Need for gateway [4L] WSN to Internet Communication, and Internet to WSN Communication [2L]	6
Module 5: Operating systems	Single-node architecture, Hardware components & design constraints [2L] Operating systems and execution environments, introduction to TinyOS and nesC [2L]	4

RESOURCES:

1. WalteneusDargie , Christian Poellabauer, “Fundamentals Of Wireless Sensor Networks Theory And Practice”, By John Wiley & Sons Publications ,2011
2. SabrieSoloman, “Sensors Handbook" by McGraw Hill publication. 2009
3. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks”, Elsevier Publications,2004
4. KazemSohrby, Daniel Minoli, “Wireless Sensor Networks”: Technology, Protocols and Applications, Wiley-Inter science
5. Philip Levis, And David Gay "TinyOS Programming" by Cambridge University Press 2009

Course Title: Web Technology	Code: OE-EC704A
Type of Course: Theory	Course Designation: Elective
Semester: 6th	Contact Hours: 3P/week
Continuous Assessment: 25 marks	Final Exam:70Marks
Writer: (Course Coordinator)	Approved by HoD (Convenor of DAB)

Pre-requisites: Basic concept of Object oriented Programming

Course Outcomes (CO's) of Web Technology

On completion of the course students will be able to

CO Number	CO statements	Revised Knowledge level
OE-EC704A.CO1	Understand the basic concept of Class and inheritance.	K2: Understand
OE EC704A.CO2	Demonstrate various types of selection statements and iteration statements in a Java program	K3: Demonstrate
OE EC704A.CO3	Discuss object-oriented features of Java language using abstract class and interface.	K2: Discuss
OE-EC704A.CO4	Analyse the errors in the program using exception handling techniques of Java.	K4: Analyse
OE-EC704A.CO5	Design applets as per the requirements with event handling facility.	K6:Design
OE-EC704A.CO6	Design good web pages using different tags, tables, forms, frames and style sheets supported by HTML.	K6:Design

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	-	-	2	-	-	-	-	3	1	2	1
CO2	3	3	2	2	-	2	2	-	-	-	-	3	1	2	1
CO3	3	3	-	2	2	1	1	-	-	-	-	3	-	2	1
CO4	2	1	-	2	-	2	3	-	-	-	-	3	-	2	1
CO5	2	3	2	1	2	-	2	-	-	-	-	2	2	2	3
CO6	3	2	2	2	2	-	2	-	-	-	-	2	2	2	3
AVG	2.67	2.5	2.25	1.67	2	1.67	2	0	0	0	0	2.67	1.5	2	1.67

University Syllabus:

Unit	Content	Hrs/Unit
Module1	Web Development: HTML, Structure, Tags, Lists, Table, Link and it's types ,Images, Form, Frame, Style sheets and it's type	2
Module 2	Introduction to Java: Java and Java applications, Java Virtual Machine(JVM), Java Runtime Environment(JRE)Java Development Kit(JDK,) Byte code, Java characteristics, Object oriented Programming, Simple java programs, Data types, Operators, Expressions, control statements, Selection statements, Iteration statements, Jump statements	3
Module 4	Classes, Inheritance: Classes in java, Declaring a class, Creating instances of class, Constructors, Argument Passing, use of static keyword, Inner class. Method overloading, Inheritance, use of super keyword, Method overriding, Abstract class, Dynamic method dispatch, use of final keyword	4
Module 5	Interface, Package: Package, Access control mechanism, Interface, Dynamic Method look up	1
Module 6	Exception Handling: Java Exception Handling Mechanism, try, catch, throw, throws and finally, Exception types, Built in Exceptions: checked and unchecked exceptions, User defined Exceptions	3
Module 7	String Handling: String and String Buffer, Constructors, String operations: character extractions, Stringcomparisons, searching, strings, modifying a string. To String() and value Of() methods, StringBuffer operations	3
Module 8	Java I/O Stream: I/O basics, Byte stream, Character stream, Reading console input, Writing console output, Reading and writing files	4
Module 9	Java Utility package: Collection overview, Collection interfaces, Collection classes: ArrayList, LinkedList, Accessing a collection using, iterator and for-Each statement	3
Module 10	Applet: Applet class, Applet architecture, Applet Skeleton, Life cycle methods, setForeground() and setBackground()methods, Using the status window,HTML Applet tag, Passing parameters to an applet, GetCodebase() and Get Documentbase() methods.	5
Module 11	Event Handling and AWT: Delegation Event Model, Event classes, Sources of Events, Event Listener interfaces,Eventhandling using adapter class, Inner and anonymous class, AWT classes: Label,Button,TextField etc.	5

RESOURCES:

Text Book

1. Java-The Complete Reference,HerbertSchildt, 9th Edition, McGraw Hill Education 2014

Reference Book

1. HTML- Complete Reference,Powell, 3rd Edition, TMH 2007
2. Core Java-An Integrated Approach, Dr.R.NageswaraRao, Dreamtech 2015

Course Title: Industrial Training	Code: EC 781
Type of Course: Sessional	
Semester: 7th	
Assessment: 100 marks	
Writer: Course Coordinator	Approved by HoD (Convenor of DAB)

Course Outcomes (CO's)

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
EC 781.CO1	Apply fundamental principles of engineering knowledge to understand cutting-edge technologies relevant to present industry/higher academia	RBT3:Applying
EC 781.CO2	Investigate relevant technical problem within specified time limit under pseudo-working environment in smaller organizational structure	RBT4:Analysing
EC 781.CO3	Interpret intra-disciplinary/multidisciplinary techno-commercial problems for identifying prototype solutions with acquired skill and proficiency	RBT4:Analysing
EC 781.CO4	Measure potential impact of learned skill from ethical, social and environmental aspect for benefit of society	RBT5:Evaluating
EC 781.CO5	Integrate responsibility, cooperation and synergetic collaboration for determining optimized solution of assigned engineering task in systematic manner	RBT6:Creating
EC 781.CO6	Evaluate significance of newly adopted skill and technology as a part of possible life-long impact	RBT6:Creating

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	-	-	-	-	-	-	-	3	-	-
CO2	1	3	1	2	1	-	-	1	1	1	1	-	3	-	-
CO3	-	2	3	3	3	-	-	-	-	-	2	2	3	-	3
CO4	-	-	1	1	-	3	3	3	-	1	1	1	-	3	-
CO5	-	-	-	-	-	3	-	1	3	3	3	2	-	2	-
CO6	-	-	-	-	-	1	-	1	-	-	-	3	-	-	3
Avg.	2.00	2.67	1.50	1.75	1.67	2.33	3.00	1.50	2.00	1.67	1.75	2.00	2.00	1.50	1.60

Course Title: Project Part-I	Code: EC782
Type of Course:	Course Designation: Sessional
Semester: 7th	Contact Hours: 8P/week
Continuous Assessment: 100 marks	
Writer: (Course Coordinators)	Approved by HoD (Convenor of DAB)

Pre-requisites: Engineering knowledge

Course Outcomes (CO's) of Project Part-I

On completion of the course students will be able to

CO#	CO Statements	Bloom's Revised Knowledge Level
EC782.CO1	Select the project ideas through literature survey and social need to solve engineering problems.	K3:Applying
EC782.CO2	Apply engineering knowledge to define problem statement.	K3:Applying
EC782.CO3	Develop the design strategy for the complete project work.	K6:Creating
EC782.CO4	Apply the appropriate modern tools to execute the project work.	K3:Applying
EC782.CO5	Explain the project to evaluate the progress of the work.	K5:Evaluating
EC782.CO6	Defend the outcomes to justify the findings.	K5:Evaluating

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1		2	2	2	3			2	3	3	2
CO2	3								3			2	3	3	2
CO3	3	3			2				3			3	3	3	3
CO4	3				3							3	3		3
CO5									2	3	3			2	3
CO6	3							3		3		3	3	3	3
AVG	3	3.00	2.00	1.00	2.50	2.00	2.00	2.5	2.75	3	3	2.60	3	2.8	2.67

Course Title: Principles of Management	Code: HS-HU701
Type Of Course: Theory	Course Designation: Compulsory
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks Attendance : 5 Marks	Final Exam: 70 Marks
Writer: (Course Coordinator)	Approved by HoD (Convenor of DAB)

Pre-requisites: Fundamental knowledge in Management

Course Objective (COB's) of Principles of Management:

HS-HU701:**COB1:** know about organisational structure, organisational behaviour and personality development.

HS-HU701:**COB2:** learn about motivational techniques and skill required to work in a group and the process of group decision making.

HS-HU701:**COB3:** know various leadership styles and the role of leader in achievement of organisational objective.

HS-HU701:**COB4:** learn about the reasons organizational change and its development.

HS-HU701:**COB5:** know how to develop a favourable working environment in an organisation through participation in management and maintain a good industrial relation for benefit of the society.

HS-HU701:**COB6:** know about consequence of industrial dispute and employee indiscipline of an organization

Course Outcome (CO's) of Principles of Management:

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
HS-HU701:CO1	Recall the concepts of Management and learn different theories used in industrial applications.	K4:Analyzing
HS-HU701:CO2	Discuss the appropriate theory required for solving real life problems.	K3:Applying
HS-HU701:CO3	Apply and demonstrate the use of Management concepts.	K3:Applying
HS-HU701:CO4	Analyze the Marketing Mix and functions of production.	K4:Analyzing
HS-HU701:CO5	Design the materials as per different materials management analysis.	K3:Applying
HS-HU701:CO6	Understand MBO and learn its application in organizations.	K5:Evaluating

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0
CO2	0	3	0	0	0	0	1	0	0	0	0	0	1	1	0
CO3	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0
CO4	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0
CO5	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AV	3.00	3.00	3.00	0	3.00	0	1.00	0	1.00	0	0	0	1	1	0

University Syllabus:

Module	Content	Hrs/Unit
I	1. Basic concepts of management: Definition - Essence, Functions, Roles, Level. [2] 2. Functions of Management: Planning - Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure -Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness [6]	08
II	3. Management and Society - Concept, External Environment, CSR, Corporate Governance, Ethical Standards. [2] 4. People Management - Overview, Job design, Recruitment & Selection, Training & Development, Stress Management. [3] 5. Managerial Competencies - Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship. [3]	08
III	6. Leadership: Concept, Nature, Styles. [3] 7. Decision making: Concept, Nature, Process, Tools & techniques. [2] 8. Economic, Financial & Quantitative Analysis - Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods - Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control. [3]	08
IV	9. Customer Management - Market Planning & Research, Marketing Mix, Advertising & Brand Management. [3] 10. Operations & Technology Management - Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS. [5]	08

RESOURCES:

1. Management: Principles, Processes & Practices - Bhat, A & Kumar, A (OUP).
2. Essentials for Management - Koontz, Revised edition, Tata McGraw Hill (TMH)
3. Management - Stoner, James A. F. (Pearson)
4. Management - Ghuman, Tata McGraw Hill(TMh)

Course Title: Fiber Optic Communication	Code: PE-EC801B
Type of Course: Theory (Elective)	Course Designation: Theory
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: (30 + 70) marks	
Writer: (Course Coordinator)	Approved by HoD (Convenor of DAB)

Pre-requisites: Electronic Devices, Electromagnetic Waves, Digital Communication

Course Outcomes (CO's) of

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
PE-EC801B.CO1	Understand the principles fiber-optic communication, the components and the bandwidth advantages.	K2:Understanding
PE-EC801B.CO2	Understand the properties of the optical fibers and optical components.	K2:Understanding
PE-EC801B.CO3	Explain operation of lasers, LEDs, and detectors.	K5:Evaluating
PE-EC801B.CO4	Interpret system performance of optical communication systems.	K5:Evaluate
PE-EC801B.CO5	Design optical networks.	K6:Creating
PE-EC801B.CO6	Interpret non-linear effects in optical fibers.	K2:Understanding

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	1	-	-	-	-	2	2	1	2
CO2	3	2	2	1	2	1	1	-	-	-	-	2	2	1	2
CO3	3	2	2	1	2	1	1	-	-	-	-	2	2	1	2
CO4	3	3	3	2	2	1	1	-	-	-	-	2	3	1	2
CO5	3	3	3	2	2	1	1	-	-	-	-	2	3	1	2
CO6	3	3	2	1	2	1	1	-	-	-	-	2	3	1	2
AVG	3.00	2.50	2.17	1.33	2.00	1.00	1.00	-	-	-	-	2.00	2.50	1.00	2.00

University Syllabus:

Unit	Content	Hrs/Unit
Module 1	Introduction to vector nature of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model	4
Module 2	Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR.	5
Module 3	Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.	10
Module 4	Optical switches - coupled mode analysis of directional couplers, electro-optic switches. Optical amplifiers - EDFA, Raman amplifier	5

Module 5	WDM and DWDM systems. Principles of WDM networks	3
Module 6	Nonlinear effects in fiber optic links. Concept of self-phase modulation, groupvelocity dispersion and soliton based communication	3

RESOURCES:

Text Books:

- T1. G. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
- T2. J. Gowar, Optical communication systems, Prentice Hall India, 1987.
- T3. G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1997
- T4. J. M. Senior, Optical Fiber Communications: Principles and Practice, Pearson, 2009

Reference Books:

- R1. T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975
- R2. G. Agrawal, Nonlinear fibre optics, Academic Press, 2nd Ed. 1994.
- R3. F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York (1990).
- R4. S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.

E-Resource (Website link/E-book/Journal/MOOC etc.):

- E1. <https://www.nptelvideos.com/course.php?id=522>

Course Title: Error Correcting Codes	Code: PE-EC801C
Type of Course: Theory	Course Designation: Theory
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 marks	
Writer: (Course Coordinators)	Approved by HoD (Convenor of DAB)

Pre-requisites: Engineering Mathematics, Basics of Digital communication system, Information theory & coding.

Course Outcomes (CO's) of Error Correcting Codes

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
PE-EC801C.CO1	Construct systematic linear codes using generator matrix for binary symmetric channel.	K3 : Applying
PE-EC801C.CO2	Apply syndrome decoding for error correction.	K3: Applying
PE-EC801C.CO3	Understand finite fields, rings and factorization of (x^n-1) over finite fields.	K2 : Understanding
PE-EC801C.CO4	Adapt appropriate polynomials to construct BCH and Reed-Solomon codes etc.	K6: Creating
PE-EC801C.CO5	Choose different algorithms to evaluate errors in received codes.	K5 : Evaluating
PE-EC801C.CO6	Apply different decoding algorithms to identify errors in Convolutional codes	K3: Applying

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	-	-	-	-	-	-	-	-	2	2	-	1
CO2	3	3	3	1	2	-	-	-	-	-	-	2	3	-	1
CO3	3	3	3	1	2	1	-	-	-	-	-	3	3	1	2
CO4	3	3	3	1	2	1	1	-	-	-	-	3	3	1	2
CO5	3	3	3	1	2	1	1	-	-	-	-	3	3	1	2
CO6	3	3	3	1	2	1	1	-	-	-	-	3	3	1	3
AVG	3	3	2.66	1	2	1	1	0	0	0	0	2.66	2.66	1	1.83

University Syllabus:

Unit	Content	Hrs/Unit
1: Module 1	Linear block codes: Systematic linear codes and optimum decoding for the binary symmetric channel; Generator and Parity Check matrices, Syndrome decoding on symmetric channels; Hamming codes; Weight enumerators and the McWilliams identities; Perfect codes, Introduction to finite fields and finite rings; factorization of (X^n-1) over a finite field; Cyclic Codes.	10

2: Module 2	BCH codes; Idempotents and Mattson-Solomon polynomials; Reed-Solomon codes, Justeen codes, MDS codes, Alterant, Goppa and generalized BCH codes; Spectral properties of cyclic codes. ; Decoding of BCH codes: Berlekamp's decoding algorithm, Massey's minimum shift register synthesis technique and its relation to Berlekamp's algorithm. A fast Berlekamp - Massey algorithm. Convolution codes; Wozencraft's sequential decoding algorithm, Fann's algorithm and other sequential decoding algorithms; Viterbi decoding algorithm.	18
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RESOURCES:

1. An Introduction to Error control codes – S. Gravano (Oxford)
2. The theory of error correcting codes- F.J. McWilliams and N.J.A. Sloane, 1977
3. Theory and practice of error control codes – R.E.Blahut, Addison Wesley, 1983.
4. Error Control Coding – S. Lin and D.J. Costello Jr. (Prentice Hall)
5. <https://nptel.ac.in/courses/117101053/>
6. <https://nptel.ac.in/courses/108/102/108102117/>

Course Title: Industrial Automation and Control	Code: PE EC802B
Type of Course: Theory	Course Designation: Optional
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 marks 5 marks attendance	Final exam- 70 marks
Writer: (Course Coordinators)	Approved by HoD (Convenor of DAB)

Pre-requisites: Control systems.

Course Outcomes (CO's) of Industrial Automation and Control

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
PE EC802B.CO1	<i>Classify</i> different sensors and actuators.	L2: Understand
PE EC802B.CO2	<i>Design</i> of signal conditioning and filter circuit for any specific sensor output.	L6:Design
PE EC802B.CO3	<i>Develop PID</i> control logic for any process model by choosing controller gains with proper tuning method.	L3: Apply
PE EC802B.CO4	<i>Explain</i> the use of SCADA for monitoring process parameters from remote location.	L2: Understand
PE EC802B.CO5	<i>Develop ladder</i> logic to operate any process.	L3: Apply
PE EC802B.CO6	<i>Demonstrate</i> different control schemes such as feed forward control, cascade control and ratio control.	L2: Understand

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	2	-	2		-	-	-		3	3	2	2
CO2	3	2	3	3	-	2		-	-	1		3	3	2	2
CO3	3	3	3	3	-	-		-	-	1		3	3	2	2
CO4	3	3	-	2	-	-		-	-	-		3	3	2	2
CO5	3	2	3	3	-	-		-	-	-		3	3	2	2
CO6	3	3	2	3	-	-		-	-	-		3	3	2	2
Avg.	3	2.66	2.75	2.66	-	2		-	-	1		3	3	2	2

University Syllabus:

Unit	Content	Hrs/Unit
1: Sensors, Actuators, Signal Conditioning	1. Sensors: Displacement sensors, Force sensors, Ultrasonic sensors, Temperature sensors, Pressure sensors etc 2. Actuators: Dc motors, Servo motors, Stepper motors, Piezo electric actuators, Pneumatic actuators etc. 3. Signal Conditioning: Filtering, Amplifying, Isolation, ADC, DAC, Sensor protection circuits, Signal transmission and noise suppression, Estimation of errors and calibration.	12
2: Controllers	1. PI controller, PD controller, PID controller and tuning methods: Ziegler-Nichols tuning method, Cohen coon tuning method, Implementation of PID controllers (digital and analog).	4
3: Programmable logic controllers	1. PLC (Programmable logic controllers): Overview, operation and architecture, PLC programming, Application examples.	3
4: Power Electronics	1. DCS (Distributed control systems): Overview, Advantages, Functional requirements of Distributed control systems, Communication for distributed control, 2. Application examples. SCADA (supervisory control and data acquisition): Introduction to SCADA, SCADA system components, architecture and communication, SCADA applications.	8
5. Advanced control techniques	1. Advanced control techniques: Feed forward control, Ratio control, Cascade control, Adaptive control, Duplex or split range control, Override control, internal mode control.	5

RESOURCES:

1. "Computer-Based Industrial Control, Krishna Kant, 2nd edition Prentice Hall of India Ltd.
2. Chemical Process Control – Theory and Practice, Stephanopoulos, Prentice Hall of India Ltd, 1984.
3. Fundamentals of Industrial Instrumentation and Process Control, William C. Dunn, TataMcGrawHill, 2009.

Course Title: Internet of Things (IoT)	Code: OE-EC803A
Type of Course: Theory	Course Designation: Open Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 30 Marks End Semester Exam: 70 marks	
Writer (Course Coordinator)	Approved by HoD (Convenor of DAB)

[Pre-requisites: Analog Electronics , Digital Electronics , Sensor & Transducers , Digital Communication]

CO#	CO Statement	Bloom's Revised knowledge Level
CO1	Understand the application Areas of IoT , Summarize the genesis and impact of IoT applications, architectures in real world. .	K2: Understand
CO2	Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks , Illustrate diverse methods of deploying smart objects and connect them to network .	K3: Apply
CO3	Understand building blocks of Internet of Things and characteristics. &Construct simple applications using Arduino. .	K3/K4: Apply/Analyze
CO4	Evaluate different protocols and select which protocol can be used for a specific application .	K5: Evaluate
CO5	Identify and develop a solution for a given application using APIs .	K6: Create/Develop
CO6	Analyze business perspective for a new product on IoT	K4: Analyze

Mapping of COs with POs and PSOs (Course Articulation Matrix):

[Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

* - Average value indicates course correlation strength with mapped PO]

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	1	2	2	3	3	-	-	-	-	3	2	2	2

CO2	3	3	2	3	3	3	3	-	-	-	-	3	3	2	2
CO3	3	3	2	2	3	1	-	-	-	-		3	3	2	2
CO4	3	3	3	3	3	3	2	-	-	-	-	3	3	2	2
CO5	3	3	3	3	3	3	3	-	-	-	3	3	3	2	3
CO6	3	3	3	3	3	3	2	-	-	-	3	3	3	3	3
AVG *	3.0 0	3.0 0	2.3 3	2.6 7	2.8 3	2.6 7	2.6	0	0	0	3	3.00	3	2.17	2.33

University Syllabus :

Internet		
of Things		
Unit No.	Contents	Hours
1.The Internet of Things: an Overview.	The flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things,Enchanted Objects, Who is Making the Internet of Things?	3
2. Design Principles for Connected Devices.	Calm and Ambient Technology, Magic as Metaphor, Privacy, Web Thinking for Connected Devices, Affordances.	3
3. Internet Principles.	Internet Communications: An Overview (IP, TCP, The IP Protocol Suite (TCP/IP), UDP), IP Addresses (DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6), MAC Addresses, TCP and UDP Ports, Application Layer Protocols.	5
4. Prototyping	Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Open Source versus Closed Source, Tapping into the Community. Prototyping Embedded Devices: Electronics, Embedded Computing Basics, Developing on the Arduino,	8
5. Prototyping the Physical Design.	Preparation, Sketch, Iterate, and Explore, Non-digital Methods, Laser Cutting, 3D Printing, CNC Milling, Repurposing/Recycling	4
6. Prototyping Online Components.	Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols.	4

7. Techniques for Writing Embedded Code	Memory Management, Performance and Battery Life, Libraries, Debugging	4
8. Prototype to Reality:	Business Models: The Business Model A Short History of Business Models, The Business Model Canvas, Who Is The Business Models For Models, Funding an	4
	Moving to Manufacture: What Are You Producing?, Designing Kits, Designing Printed Circuit Boards, Manufacturing, Printed Circuit Boards, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software,	4
9. Ethics	Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.	3

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Learning Resources
Text Books
<ol style="list-style-type: none"> 1. Jeeva Jose, Internet of Things, Khanna Publishing House 2. Adrian McEwen, Hakim Cassimally- Designing the Internet of Thing Wiley Publications, 2012. 3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743)
Reference Books
<ol style="list-style-type: none"> 1. Sudip Misra, Anandarup Mukherjee, Arijit Roy -Introduction to IoT - Cambridge University Press -2021 2. Arshdeep Bahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014 3. Srinivasa K G, Internet of Things, CENGAGE Learning India, 2017
Online Resources :
<p>NPTEL-SAWAYAM : Introduction to Internet of Things : Prof. Sudip Misra (IIT, Kharagpur)</p> <p>(https://onlinecourses.nptel.ac.in/noc22_cs96/preview)</p>

Course Title: Cyber Security	Code: OE-EC803C
Type Of Course: Theory	Course Designation: Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks Attendance : 5 Marks	Final Exam: 70 Marks
Writer: (Course Coordinator)	Approved by HoD (Convener of DAB)

Pre-requisites: EC-602 Computer Network.

COURSE OBJECTIVE:

- Explain the the different types Cyber-crimes.
- Provide cyber-security awareness.
- Create counter measure against cyber-crimes
- Familiar with different cyber-crimes laws in India and outside.

COURSE OUTCOMES (COs)

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
OE-EC803C.CO1	Explain the different types of cyber-crime on cyber space.	Understand (Level II)
OE-EC803C.CO2	Recall the different laws related to cyber-crimes.	Remember (Level I)
OE-EC803C.CO3	Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software or tools.	Apply (Level III)
OE-EC803C.CO4	Design and develop a security architecture for an organization.	Create (Level VI)
OE-EC803C.CO5	Find solutions in cyber-crime investigations, evidence and applicable law for realworld case studies.	Analyze (Level IV)
OE-EC803C.CO6	Examine the software vulnerabilities and security solutions to reduce therisk of exploitation.	Analyze (Level IV)

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	1	1	3	1	-	-	2	1	2	1
CO2	1	1	1	-	-	2	1	2	-	-	-	2	1	2	1
CO3	3	3	3	1	3	2	2	2	-	-	-	2	3	3	2
CO4	3	2	3	2	3	1	1	2	-	-	-	2	3	3	2
CO5	3	1	1	3	2	2	-	2	-	-	-	2	2	3	2
CO6	3	3	3	1	2	2	-	2	-	-	-	2	2	3	2
AVG.	2.67	1.83	2.00	1.75	2.50	1.67	1.25	2.17	1.00	0.00	0.00	2.00	2.00	2.67	1.67

University Syllabus :

Unit	Content	Hrs/Unit
1	Introduction: [8L] Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures Challenges. Botnets.	8
2	Cyber security objectives and guidance [10L] Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project – Cyber Security Management – Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.	10
3	Cyber governance issues [10L] Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging - Cyber User Issues - Malvertising - Impersonation – Appropriate Use – Cyber Crime – Geo location – Privacy - Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare.	10
4	Cyber infrastructure issues [6L] Cyber Infrastructure Issue – economics ,finance and banking – Health care – Industrial Control systems. Cyber insurance, cyber security in international relations.	6

GATE syllabus : Not Applicable

RESOURCES:

Text Book

1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss “Cyber Security Policy Guidebook” John Wiley & Sons 2012.
2. Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.

Reference Book

1. Rick Howard “Cyber Security Essentials” Auerbach Publications 2011.
2. B.G Raggad, “ Information Security Management”, CRC Press, Taylor Francis, 2015

Course Title: Organizational Behavior	Code: OE-EC804C
Type Of Course: Theory	Course Designation: Compulsory
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks Attendance : 5 Marks	Final Exam: 70 Marks
Writer: (Course Coordinator)	Approved by HoD (Convenor of DAB)

Pre-requisites: Fundamental knowledge in Management

Course Objective (COb's) of Organizational Behavior:

OE-EC804C:COb1: know about organisational structure, organisational behaviour and personality development.

OE-EC804C:COb2: learn about motivational techniques and skill required to work in a group and the process of group decision making.

OE-EC804C:COb3: know various leadership styles and the role of leader in achievement of organisational objective.

OE-EC804C:COb4: learn about the reasons organizational change and its development.

OE-EC804C:COb5: know how to develop a favourable working environment in an organisation through participation in management and maintain a good industrial relation for benefit of the society.

OE-EC804C:COb6: know about consequence of industrial dispute and employee indiscipline of an organization

Course Outcome (CO's) of Organizational Behavior:

On completion of the course students will be able to

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
OE-EC804C:CO1	Recall the concepts of Management and learn different theories used in industrial applications.	K4:Analyzing
OE-EC804C:CO2	Discuss the appropriate theory required for solving real life problems.	K3:Applying
OE-EC804C:CO3	Apply and demonstrate the use of Management concepts.	K3:Applying
OE-EC804C:CO4	Analyze the Marketing Mix and functions of production.	K4:Analyzing
OE-EC804C:CO5	Design the materials as per different materials management analysis.	K3:Applying
OE-EC804C:CO6	Understand MBO and learn its application in organizations.	K5:Evaluating

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0
CO2	0	3	0	0	0	0	1	0	0	0	0	0	1	1	0
CO3	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0
CO4	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0
CO5	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AV	3.00	3.00	3.00	0	3.00	0	1.00	0	1.00	0	0	0	1	1	0

University Syllabus:

Module	Content	Hrs/Unit
UNIT-1-Introduction to Organization and Organizational Behaviour	Meaning and definition of organization [3L], features and principles of organization[3L], Organizational structures and nature of organizational behavior[3L].	09
UNIT-2-Personality	Meaning of Personality, Personality Development, Determinants of personality, Application of personality in the organizational level[3L]. Motivation-concept of motivation, motivation and behavior, Theories of motivation, Need theory, Hygiene theory, Theory X and Theory Y, Elements of sound motivational system, Motivation in Indian organization[6L].	09
UNIT-3-Leadership	Meaning, Theory of leadership, Trait theory, Behavioural theory, Leadership styles, Leadership in Indian Organisation[3L]. Group Dynamics-Concept of Group Dynamic, Types of Group, Group Behaviour, Group Decisions, Techniques to improve group decision, merits and de-merits of group decision[3L].	06
UNIT-4- Organizational Change	Meaning and Nature of organizational change, Factors of organizational change, Resistance to change, Factors in resistance, Overcoming resistance to change, Organizational Development-Concept, Objectives and process of organization development[8L].	08

RESOURCES:

Text Book

1. ORGB, An innovative Approach to Learning and Teaching ,Organizational Behaviour, Nelson, Quick, Khandelwal, Cengage Learning, 2012.

Reference Book

1. Organizational Behaviour Dr S.S.Khanka, S.Chand, 2014.
2. Organisational Behaviour. Arun Kumar and N.Meenaskshi .Vikas Publishing House, 2009.
3. Managing Organisational Behaviour, Moorhead & Griffin. CENGAGE Learning, 2014.
4. Human Behaviour at Work. Keith Davies, 2002.

Course Title: Project Part-II	Code: EC881
Type of Course:	Course Designation: Sessional
Semester: 8th	Contact Hours: 15P/week
Continuous Assessment: 100 marks	
Writer: (Course Coordinators)	Approved by HoD (Convenor of DAB)

Pre-requisites: Engineering knowledge

Course Outcomes (CO's) of Project Part-II

On completion of the course students will be able to

CO#	CO Statements	Bloom's Revised Knowledge Level
EC881.CO1	Build the hardware/software modules to develop the project work.	K3:Applying
EC881.CO2	Compile the different modules to finalise the work.	K6:Creating
EC881.CO3	Measure the project outcomes for evaluation of accomplishment.	K5:Evaluate
EC881.CO4	Analyze the performance of the project work.	K4:Analyzing
EC881.CO5	Summarize the entire project work in terms of report.	K2:Understanding
EC881.CO6	Defend the outcomes to justify the findings.	K5:Evaluating

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		3	3	3				3			3	3	3	3
CO2			2						3		3	3	2	3	3
CO3				3	2							2	3		2
CO4		3										3	3		3
CO5									3	3	3	3		3	3
CO6	3							3		3		3	3	3	3
AVG	3	3.00	2.50	3.00	2.50	0	0	3	3	3	3	2.83	2.8	3	2.83

Course Title: Grand Viva	Code: EC882
Type of Course: Sessional	Course Designation: Sessional
Semester: 8th	Contact Hours:
Continuous Assessment: 100 marks	
All Faculty(Course Coordinators)	Approved by HoD (Convenor of DAB)

Course Outcome

CO Number	CO statement	Knowledge Level of revised Bloom's Taxonomy
EC882.CO1	Evaluate domain knowledge in fundamental science for developing foundation of engineering maintaining environmental aspects (Basic Science)	L5
EC882.CO2	Interpret qualitative attributes for ethical, social and professional values with sound communication attitudes as an individual or team member (Humanities)	L5
EC882.CO3	Estimate engineering science knowledge for developing hierarchical professional growth related with electronics and communication engineering	L5
EC882.CO4	Measure ability to solve complex engineering problems through professional core subjects relevant with electronics and communication engineering for benefit of the Society	L5
EC882.CO5	Evaluate design-oriented professional knowledge associated with core discipline for conducting complex investigations (professional elective)	L5
EC882.CO6	Assess co-related subject expertization relevant with information science and engineering for sustainability in professional sector/academia as a part of life-long learning (free elective & overall)	L5

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2				2						3	2	0
CO2						2		2	2	2			3	2	0
CO3	3	3	3										3	0	0
CO4	3	3	3	3	3								3	0	0
CO5	3	2	2	3	2								2	0	0
CO6	1		2				2					3	2	2	3
Avg.	2	2.75	2.4	3	2.5	2	2	2	2	2	0	3	<u>2.66</u>	<u>2</u>	<u>3</u>