Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Electrical & Electronics Engineering (EEE)

(Applicable from the academic session 2018-2019)

Semester-VII

Name of the course		**ANALOG AND DIGITAL COMMUNICATION**	
Course Code: PC-EEE 701		**Semester: 7th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0 hr/week		Assignment & Quiz: 10 Marks	
Practical: 0 hrs/week		Attendance: 05 Marks	
Credit Points: 3		End Semester Exam: 70 Marks	
Objective:			
1.	To understand basic concept analog, digital and data communication.		
2.	To understand different methods of modulation.		
3.	To understand error detection and correction technique.		
4.	To solve problem related to analog and digital communication.		
Pre-Requisite			
1.	Analog Electronics (PC-EE-302)		
2.	Digital Electronics (PC-EEE-402)		
Unit	Content	Hrs	Marks
1	**Introduction to Communication System:** Communication, Communication systems, Modulation, bandwidth requirement.	3	
2	**Noise:** External noise, internal noise, Noise calculations, noise figure, noise temperature	4	
3	**Amplitude Modulation:** Amplitude modulation theory – Frequency spectrum of AM wave, representation of AM wave, Power relation in the AM wave	5	
4	**Frequency and Phase Modulation:** Theory of Frequency and Phase Modulation: Description of the systems, mathematical representation of FM, Frequency spectrum of FM wave, Phase modulation, Intersystem comparison, Noise and FM: Effect of noise on carrier, pre-emphasis and de-emphasis, other form of interference, comparison of wide band and narrow band FM	10	
5	**Modulation of Digital Signal:** ASK, FSK, and PSK: Introduction, modulation and demodulation circuits and waveforms Pulse Modulation: Types, PWM	6	
6	**Introduction to Data and Network Communication:** Introduction, Data Communication System, Data Communication Links . Character Codes, Digital Data Rates, Serial Data Formats Encoded Data Formats.	5	
7	**Error Detection and Correction:** Introduction, Asynchronous Data Method, Synchronous Data Error Methods, Error Testing Equipment.	5	

Text books:

1. Modern Digital and Analog Communication Systems , B. P. Lathi and Zhi Ding, Hari Mohan Gupta, Oxford University Press, 2017
2. Electronic Communication Systems , G. Keddedy, B. Davis, S. Prasanna, Mc-Graw Hill Education, 2011
3. Communication Systems: Analog and Digital by R. P. Singh and B. D. Sapre, Tata-McGraw Hill, 2012
4. Data and Network Communications by Michael A. Miller, Cengage Learning , 1999. International Publication.

Reference books:

1. An introduction to Analog and Digital Communications, Simon Hyekin and Micheal Moher, Wiely, 2006.
2. Digital and Analog Communication Systems, K.S. Shanmugan, Wiely India Pvt. Ltd, 2006.

Course Outcome: After completion of this course, the learners will be able to

1. explain the principle of amplitude, frequency and phase modulations .
2. apply error detection and correction techniques.
3. compare different types of digital modulation techniques.
4. explain data communication systems. .
5. estimate noise in communication systems. .

Special Remarks (if any)

The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Maulana Abul Kalam Azad University of Technology, West Bengal

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Syllabus for B. Tech in Electrical & Electronics Engineering (EEE)

(Applicable from the academic session 2018-2019)

Name of the course	**ELECTRIC DRIVE**
Course Code: PE-EEE 701A	**Semester: 7th**
Duration: 6 months	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 0 hr/week	Assignment & Quiz: 10 Marks
Practical: 0 hrs/week	Attendance: 05 Marks
Credit Points: 3	End Semester Exam: 70 Marks

Objective:

1.	To understand basic concept, classification and principle of operation of Electric Drive.
2.	To understand methods of starting and braking of Electric Drive.
3.	To understand methods of control of speed of DC and AC machines.
4.	To solve problem related to Electric Drive.

Pre-Requisite

1.	Basic Electrical Engineering (ES-EE-101)
2.	Electric Machine-I (PC-EEE-401)
3.	Electric Machine-II(PC-EEE-501)

Unit	Content	Hrs	Marks
1	**Electric Drive:** Concept, classification, parts and advantages of electrical dives. Types of Loads, Components of load toques, Fundamental torque equations, Equivalent value of drive parameters for loads with rotational and translational motion. Determination of moment of inertia, Steady state stability, Transient stability. Multi-quadrant operation of drives. Load equalization.	5	

2	**Motor power rating:** Thermal model of motor for heating and cooling, classes of motor duty, determination of motor rating for continuous, short time and intermittent duty, equivalent current, torque and power methods of determination of rating for fluctuating and intermittent loads. Effect of load inertia & environmental factors.	5	
3	**Stating of Electric Drives:** Effect of starting on Power supply, motor and load. Methods of stating of electric motors. Acceleration time, Energy relation during stating. Methods to reduce the Energy loss during starting. **Braking of Electric Drives:** Types of braking, braking of DC motor, Induction motor and Synchronous motor, Energy loss during braking,	6	
4	**DC motor drives:** Modeling of DC motors**,** State space modeling, block diagram & Transfer function, Single phase, three phases fully controlled and half controlled DC drives. Dual converter control of DC drives. Power factor, supply harmonics and ripple in motor current. Chopper controlled DC motor drives. Closed loop control of DC Drives.	8	
5	**Induction motor drives:** Stator voltage variation by three phase controllers, Speed control using chopper resistance in the rotor circuit, slip power recovery scheme. Pulse width modulated inverter fed and current source inverter fed induction motor drive. Volts/Hertz Control, Vector or Field oriented control.	6	
6	**Synchronous motor drives:** Variable frequency control, Self Control, Voltage source inverter fed synchronous motor drive, Vector control.	5	
7	Introduction to Solar and Battery Powered Drive, Stepper motor, Switched Reluctance motor drive **Industrial application:** Drive consideration for Textile mills, Steel rolling mills, Cement mills, Paper mills, Machine tools. Cranes & hoist drives.	5	

Text books:

1. Fundamental of Electrical Drives, G.K. Dubey, New Age International Publication.
2. Electric Drives, Vedam Subrahmanyam, TMH
3. A first course on Electrical Drives, S.K. Pillai, , New Age International Publication.

Reference books:

1. Electric motor drives, R. Krishnan, PHI
2. Modern Power Electronics & Ac drives, B.K. Bose, Pearson Education.
3. Electric Motor & Drives. Austin Hughes, Newnes.

Course Outcome: After completion of this course, the learners will be able to

1. explain the principle of operation of Electric Drive.
2. describe different methods of starting and braking of Electric Drive.
3. model and control DC Drive
4. control speed of Induction and Synchronous motors.
5. recommend drives for different applications.
6. estimate ratings, variables and parameters of Electric Drives.

Special Remarks (if any)

The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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Syllabus for B. Tech in Electrical & Electronics Engineering (EEE)

(Applicable from the academic session 2018-2019)

Name of the course		**DIGITAL CONTROL SYSTEM**	
Course Code: PE-EEE 701B		**Semester: 7th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0hr/week		Assignment & Quiz: 10 Marks	
Credit Points: 3		Attendance: 05 Marks	
		End Semester Exam: 70 Marks	
Objective:			
1.	To understand the principle of sampling and reconstruction of signals.		
2.	To find Z-tranaform and inverse Z-transform of systems.		
3.	To carry out the analysis and design of digital control systems		
4.	To design compensators for digital control system to achieve desired specifications.		
5.	To represent digital control systems using state space models.		
6.	To analyze the effect sampling on stability, controllability and observability.		
7.	To design digital controllers for industrial applications.		
8.	To solve numerical problems on the topics studied.		
Pre-Requisite			
1.	Control system (PC-EE-503)		
Unit	Content	Hrs	Marks
1	**Sampling and reconstruction:** Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.	03	
2	**Z-transform:** Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms	05	
3	**Z- Plane analysis of discrete-time control system:** Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.	05	
4	**State space analysis:** State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.	06	
5	**Controllability and observability:** Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function	04	
6	**Stabilty analysis:** Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of	05	

	closed loop systems in the Z-Plane. Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.		
7.	**Design of discrete time control system by conventional methods:** Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.	06	
8.	**State feedback controllers and observers:** Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.	05	

Text book:

1. Digital Control and State Variable Methods , M. Gopal, TMH Publishers
2. Discrete-time Control Systems, K. Ogata, Pearson Education,
3. Digital Control Systems, B.C. Kuo, Wiley Publications.
4. Control System Engineering, I.J. Nagrath, M. Gopal, New age International.

Reference books

1. Digital control of dynamic systems, Gene F. Franklin, J. David Powell, and Michael Workman 3rd ed, 1998, Addison-Wesley.
2. Digital Control Systems, design, identification and implementation, Landau, Ioan Doré, Zito, Gianluca, Springer-Verlag London.

Course Outcome:

After completion of this course, the learners will be able to

1. explain the principle of sampling and reconstrction of analog signal.
2. perform Z-transformation and inverse Z-tranaformation of systems.
3. analyse and design digital control systems.
4. design compensators for digital control system to achieve desired specifications.
5. represent digital control systems using state space models.
6. analyze the effect sampling on stability, controllability and observability.

Special Remarks (if any)

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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Syllabus for B. Tech in Electrical & Electronics Engineering (EEE)

(Applicable from the academic session 2018-2019)

Name of the course	**HVDC TRANSMISSION SYSTEM**
Course Code: PE-EEE-701C	**Semester: 7th**
Duration: 6 months	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 0hr/week	Assignment & Quiz: 10 Marks
Practical: hrs/week	Attendance: 05 Marks
Credit Points: 3	End Semester Exam: 70 Marks

Objective:

1.	To understand the basics of DC power transmssion system
2.	To analyse HVDC converters.
3.	To understand methods of control of HVDC system
4.	To understand causes of fault and protection against fault of converters.
5.	To understand function of smooting reactor and transient over voltage of DC line
6.	To understand methods of reactive power control.
7.	To solve numerical problems on the topics studied.

Pre-Requisite

1.	Electric Circuit Theory (PC-EE-301)
2.	Power system-1 (PC-EE-502)
3.	Control system (PC-EE-503)
4.	Power Electronics (PC-EE-504)

Unit	Content	Hrs	Marks
1	**DC power transmission technology:** Introduction, Comparison of HVAC and HVDC transmission system, Applications of DC transmission, Description of DC transmission system, Configurations, Modern trends in DC transmission.	04	
2	**Analysis of HVDC converters:** Pulse number, Choice of converter configuration, Simplified analysis of Graetz circuit, Converter bridge characteristics, Characteristics of a twelve-pulse converter, Detailed analysis of converters with and without overlap	06	
3	**Converter and HVDC system control:** General, Principles of DC link control, Converter control characteristics, System control hierarchy, Firing angle control, Current and extinction angle control, Starting and stopping of DC link, Power control, Higher level controllers.	06	
4	**Converter faults and protection:** Converter faults, Protection against over-currents, Overvoltages in a converter station, Surge arresters, Protection against over-voltages.	05	
5	**Smoothing reactor and DC line:** Introduction, Smoothing reactors, DC line, Transient over voltages in DC line, Protection of DC line, DC breakers, Monopolar operation, Effects of proximity of AC and DC transmission lines.	06	
6	**Reactive power control:** Reactive power requirements in steady state, Sources of reactive power, Static VAR systems, Reactive	06	

	power control during transients, Harmonics and filters, Generation of harmonics, Design of AC filters and DC filters.		
7.	**Component models for the analysis of ac/dc systems:** General, Converter model, Converter control, Modelling of DC network, Modelling of AC networks. **Power flow analysis in AC/DC systems:** General, Modelling of DC links, Solution of DC load flow, Discussion, Per unit system for DC quantities.	06	

Text book:

1. HVDC Power transmission systems , K.R. Padiyar , Third Edition, New Age International Publishers

Reference books

1. Power Transmission by Direct Current, Erich Uhlmann, Fourth Indian Reprint, Springer International Edition, 2012.
2. HVDC Transmission, S Kamakshaiah, V Kamaraju , 2nd Edition, Mcgraw Hill Education, 2020.
3. Direct Current Transmission, E.W.Kimbark, Wiley–Blackwell; Volume 1 edition (1 January 1971)
4. H.V.D.C Transmission , J Arrillaga , 1st Edition, The Institution of Engineering and Technology, 1998

Course Outcome:

After completion of this course, the learners will be able to

1. choose intelligently AC and DC transmission systems for the dedicated application(s).
2. identify the suitable two-level/multilevel configuration for high power converters.
3. select the suitable protection method for various converter faults.
4. identify suitable reactive power compensation method.
5. decide the configuration for harmonic mitigation on both AC and DC sides..
6. solve numerical problems related to converters, power flow analysis, reactive power control.

Special Remarks (if any)

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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(Applicable from the academic session 2018-2019)

Name of the course		**EMBEDDED SYSTEM**	
Course Code: OE-EEE 701A		**Semester: 7th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0hr/week		Assignment & Quiz: 10 Marks	
Credit Points: 3		Attendance: 05 Marks	
		End Semester Exam: 70 Marks	
Objective:			
1.	To understand fundamental concepts of design principles of embedded system.		
2.	To understand the role of firmware, operating systems in correlation with hardware systems.		
Pre-Requisite			
1.	Programming for problem solving (ES-CS 201)		
2.	Micro processor & Micro controller (PC-EE 602)		
Unit	Content	Hrs	Marks
1	**Introduction to Embedded Systems:** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.	05	
2	**Typical Embedded System:** Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Interfacing techniques, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.	07	
3	**Advanced Embedded Microcontrollers:** PIC Microcontrollers: Overview and features; PIC 16C6X/7X - File Selection Register (FSR), PIC Reset Actions, PIC Oscillator connections, PIC Memory Organization, PIC 16C6X/7X instructions, Addressing Modes, I/O Ports, Interrupts in PIC 16C61/71, Timers. PIC 16F8XX Flash Microcontroller – Introduction, Pin diagram, Registers, Memory organization, Interrupts, I/O Ports, Timers. Introduction to AVR microcontroller: Introduction to AVR (ATmega 328p-pu) microcontroller, pin layout, architecture, program memory, Data Direction register, Port Registers (PORTx), PWM registers (8-bit), ADC registers. Introduction to ARM microcontroller: Architecture of ARM Embedded microcontroller, ARM instruction sets.	12	
4	**Embedded Firmware:** Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.	06	
5	**RTOS Based Embedded System Design:** Operating System Basics, Types of Operating Systems, Tasks, Process and Threads,	10	

	Multiprocessing and Multitasking, Task Scheduling, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.		

Text book:

1. Introduction to Embedded Systems, Shibu K.V, Mc Graw Hill. 2017

Reference books:

1. Embedded Systems – Architecture, Programming and design, Raj Kamal, McGraw Hill Education, 2017
2. Embedded System Design: A unified Hardware/ Software introduction, Tony Givargis and Frank Vahid, Wiley 2006
3. Design with PIC Microcontrollers , J. B. Peatman, Pearson India,2008
4. Microcontrollers (Theory and Applications) – A. V. Deshmukh, TMH Education Private Limited, 2017
5. Programming and Customizing the AVR Microcontroller, Dhananjay Gadre, McGraw Hill Education, 2014.

Course Outcome:

After completion of this course, the learners will be able to

1. discuss the definition, purpose, application, classification , quality characteristics and attributes of Embedded Systems
2. explain the internal structure of the Embedded system.
3. interface IO devices and other peripherals with micro controllers in Embedded systems.
4. write programs for Micro controllers in Embedded systems.
5. apply the concept of Embedded firmware in design of Embedded systems.
6. design RTOS based Embedded systems.

Special Remarks (if any)

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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(Applicable from the academic session 2018-2019)

Name of the course		**COMPUTER NETWORK**	
Course Code: OE-EEE 701B		**Semester: 7th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0hr/week		Assignment & Quiz: 10 Marks	
Credit Points: 3		Attendance: 05 Marks	
		End Semester Exam: 70 Marks	
Objective:			
1.	To understand the fundamental concepts of data communication and computer networking.		
2.	To understand different layers of OSI, TCP/IP model in networking.		
Pre-Requisite			
1.	Data Structure and Algorithm (OE-EE 501A)		
2.	Operating System		
Unit	Content	Hrs	Marks
1	**Overview of Data Communication and Networking:** Introduction, Data communications: components, data representation (ASCII, ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.	06	
2	**Physical Level:** Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit Switching: time division & space division switch, TDM bus; Telephone Network.	04	
3	**Data link Layer:** Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back-N ARQ, Selective repeat ARQ, HDLC. **Medium Access sub layer:** Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet (in brief).	10	
4	**Network layer:** Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : IP addressing, sub netting; Routing : techniques, static vs. dynamic routing , Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6. **Transport layer:** Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm	12	

5	**Application Layer:** Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls. **Modern topics:** ISDN services & ATM, DSL technology, Cable Modem: Architecture and operation in brief. Wireless LAN: IEEE 802.11, Introduction to blue-tooth.**:**	08	

Text book:

1. Data Communications and Networking , A. Forouzan , TMH, 2004
2. Computer Networks , A. S. Tanenbaum, Pearson Education, 2003.
3. Data and Computer Communications (5th Ed.), W. Stallings, Pearson Education, 2017.

Reference books:

1. Communication Networks, Leon, Garica, Widjaja, McGraw Hill, 2017.
2. High performance Communication Networks, Walrand, Elsvier India, 2004.
3. Internetworking with TCP/IP, vol. 1, 2, 3, Comer, Pearson Education, 2000.

Course Outcome:

After completion of this course, the learners will be able to

7. explain the concepts of data communication and networking.
8. identify the different types of network topologies and protocols.
9. describe the function of a network system with OSI and TCP/IP model.
10. differentiate different types of routing protocol.
11. apply principles of congestion control .
12. implement different schemes for security of the networks.

Special Remarks (if any)

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

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(Applicable from the academic session 2018-2019)

Name of the course		**INTRODUCTION TO MACHINE LEARNING**	
Course Code: OE-EEE 701C		**Semester: 7th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0hr/week		Assignment & Quiz: 10 Marks	
Credit Points: 3		Attendance: 05 Marks	
		End Semester Exam: 70 Marks	
Objective:			
1.	To understand fundamental concepts of Machine Learning		
2.	To apply Machine Learning in real life applications.		
Pre-Requisite			
1.	Programming for problem solving (ES-CS 201)		
Unit	Content	Hrs	Marks
1	**Basics of Machine Learning and Python:** Review of Linear Algebra, Definition of learning systems; Designing a learning system, Goals and applications of machine learning; Classification of learning system, Basic concepts in Machine Learning. Python Basics – string, number, list, tuple, Dictionary, functions, conditional statement, Loop statements, Numpy, Matplotlib, simple programming exercises using python.	12	
2	**Supervised Learning:** Linear regression with one variable, Linear regression with multiple variables, Logistic regression; Linear Methods for Classification; Linear Methods for Regression; Decision trees, overfitting.	07	
3	**Support Vector Machines:** Introduction, Maximum Margin Classification, Mathematics behind Maximum Margin Classification, Maximum Margin linear separators, non-linear SVM, Kernels for learning non-linear functions.	07	
4	**Unsupervised Learning:** Learning from unclassified data, Clustering - Hierarchical Agglomerative Clustering, K-means partitional clustering, Expectation maximization (EM) for soft clustering; Dimensionality reduction – Principal Component Analysis, factor Analysis, Multidimensional scaling, Linear Discriminant Analysis.	07	
5	**Applications of Machine Learning:** Strategies, guidelines for good design, performance measurement, Reading Data, PreProcessing Data, handwriting recognition, object detection, face detection.	07	

Text book:

1. Machine Learning, Dr. Rajjiv Chopra, Khanna Publishing, 2020
2. Introduction to Machine Learning, EthemAlpaydi, PHIl, 2015
3. Building Machine Learning Systems with Python, Richert& Coelho, Packt publishing, 2013

Reference books:

1. The Elements Of Statistical Learning: Data mining, Infarence and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, 2017.
2. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, MIT Press 2012.

Course Outcome:

After completion of this course, the learners will be able to

1. explain the basics concepts and classification of Machine Learning .
2. write simple programs using python.
3. describe Supervised Learning concepts.
4. explain the concept of Support Vector Machine.
5. describe unsupervised learning concepts and dimensionality reduction techniques.
6. apply Machine Learning in a range of real-world applications .

Special Remarks (if any)

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(Applicable from the academic session 2018-2019)

Name of the course		**INTERNET OF THINGS**	
Course Code: OE-EEE-702A		**Semester: 7th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0hr/week		Assignment & Quiz: 10 Marks	
Credit Points: 3		Attendance: 05 Marks	
		End Semester Exam: 70 Marks	
Objective:			
1.	To understand the terminology, technology and its applications		
2.	To understand the concept of M2M (machine to machine) with necessary protocols		
3.	To learn the Python Scripting Language which is used in many IoT devices.		
4.	To understand the Raspberry PI platform, that is widely used in IoT applications.		
5.	To understand the implementation of web based services on IoT devices.		
Pre-Requisite			
1.	Programming for problem solving (ES-CS201)		
Unit	Content	Hrs	Marks
1	**Introduction to Internet of Things:** Definition and characteristics of IoT, Physical design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs, IoT enabled technologies – Wireless sensor networks, Cloud computing, Big data analytics, Communication protocols, Embedded systems, IoT levels and templates, Domain specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.	08	
2	**IoT and M2M:** Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER	06	
3	**Introduction to Python:** Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling. Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib.	08	
4.	**IoT Physical Devices and Endpoints:** Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.	08	
5.	**IoT Physical Servers and Cloud Offerings:** Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API	08	

Text book:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2016.
3. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things**,** David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, Pearson Education, 2017.
4. Internet of Things, K.G. Srinivasa , G.M. Siddesh, R.R. Hanumantha, CENGAGE Leaning India, 2018

Reference books:

1. Internet of Things (A Hands-on-Approach), Arshdeep Bahga and Vijay Madisetti, VPT, 2014.
2. Internet of Things: Architecture and Design Principles, Raj Kamal , McGraw Hill Education, 2017.

Course Outcome:

After completion of this course, the learners will be able to

1. explain the definition and usage of the term “Internet of Things” in different contexts
2. explain the key components that make up an IoT system.
3. differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack
4. build and test a IoT system involving prototyping, programming and data analysis
5. apply cloud computing and data analytics in a typical IoT system

Special Remarks (if any)

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Electrical & Electronics Engineering (EEE)

(Applicable from the academic session 2018-2019)

Name of the course		**COMPUTER GRAPHICS**	
Course Code: OE-EEE-702B		**Semester: 7th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0hr/week		Assignment & Quiz: 10 Marks	
Credit Points: 3		Attendance: 05 Marks	
		End Semester Exam: 70 Marks	
Objective:			
1.	To understand fundamental concepts and theory of computer graphics		
2.	To understand the concept of graphics systems, input devices, geometric representations, 2D/3D transformations, viewing and projections and visible surface detection.		
Pre-Requisite			
1.	Programming for problem solving (ES-CS201)		
2.	Mathematics (BS-M301)		
3.	Data structure and algorithm(OE-EE-501A)		
Unit	Content	Hrs	Marks
1	**Introduction to Computer graphics & graphic systems:** Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.	06	
2	**Scan conversion:** Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.	05	
3	**2D Transformations and viewing:** Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method **3D transformation & viewing:** 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, view port clipping, 3D viewing	12	
4	**Plane Curves and Surfaces:** Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, Parametric Representation of a Hyperbola, A	06	

	Procedure for using Conic Sections, The General Conic Equation; Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces		
5	**Visible-Surface Determination:** Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.	06	
6	**Color & shading models :** Light & color model; interpolative shading model; Texture. **Introduction to Ray-tracing:** Human vision and color, Lighting, Reflection and transmission models	05	

Text book:

1. Computer Graphics (C version), Hearn, Baker, Pearson Education, 2002
2. Schaum's outlines Computer Graphics , Z. Xiang, R. Plastock , McGraw Hill Education, 2000.
3. Mathematical Elements for Computer Graphics, D. F. Rogers, J. A. Adams, McGraw Hill Education, 2017.

Reference books:

1. Computer Graphics, Multimedia and Animation, M.K. Pakhira, PHI, 2010.

Course Outcome:

After completion of this course, the learners will be able to

1. explain Computer graphics and graphic systems.
2. test and implement line drawing algorithm, circle and ellipse drawing algorithm, area filling algorithms.
3. Perform 2D and 3D transformation and viewing.
4. apply algorithms for visible surface determination.
5. explain colors and shading models and ray tracing.

Special Remarks (if any)

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Syllabus for B. Tech in Electrical & Electronics Engineering (EEE)

(Applicable from the academic session 2018-2019)

Name of the course		**SOFT COMPUTING TECHNIQUES**	
Course Code: OE-EEE 702C		**Semester: 7th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0hr/week		Assignment & Quiz: 10 Marks	
Credit Points: 3		Attendance: 05 Marks	
		End Semester Exam: 70 Marks	
Objective:			
1.	To understand the theory of Neural network, Fuzzy logic and Genetic Algorithm.		
2.	To Introduce neural networks, Genetic Algorithm and Fuzzy logic from an engineering perspective.		
Pre-Requisite			
1.	Programming for problem solving (ES-CS 201)		
Unit	Content	Hrs	Marks
1	**Introduction:** Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.	05	
2	**Fuzzy sets and Fuzzy logic systems:** Classical Sets and Fuzzy Sets and Fuzzy relations: Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations. Membership functions: Features of membership functions, standard forms and boundaries, different fuzzification methods. Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods. Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System- Mamdani Fuzzy Models – Sugeno Fuzzy Models. Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting Fuzzy Control, Convention control systems, Fuzzy logic control vs. PID control.	12	
3	**Neural Network**: Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron. Learning Methods : Hebbian, competitive, Boltzman etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back propagation and multi layer networks. Competitive learning networks: Kohonen self organizing networks, Hebbian learning; Hopfield Networks. Neuo-Fuzzy modelling:Applications of Neural Networks: Pattern Recognition	10	

	and classification**:**		
4	**Genetic Algorithms:** Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition.	08	
5	**Other Soft Computing techniques:** Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).	05	

Text book:

1. Fuzzy logic with engineering applications, Timothy J. Ross, Wiley ,2011
2. Neural Networks Fuxxy Logic and Genetic Algorithm: Synthesis and Application, S. Rajashekharan and G.A. Vijaylakshmi Pai, PHI,2013
3. Principles of Soft Computing, S N Sivanandam, S.N. Deepa, Wiley , 2011.

Reference books:

1. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg, Addison Wesley, 1989.
2. Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, Pearson, 1996.
3. Neural Networks: A Classroom Approach, Satish Kumar, McGraw Hill, 2017.
4. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg, Pearson/PHI
5. Introduction to Soft Computing-Neuro Fuzzy and Genetic Algorithm, Samir Roy & Udit Chakraborty, Pearson, 2013.

Course Outcome:

After completion of this course, the learners will be able to

1. explain soft computing techniques and their roles in building intelligent machines
2. anlyse the feasibility of application of soft computing techniques for a particular problem
3. effectively use existing software tools to solve real problems using a soft computing approach
4. evaluate solutions by various soft computing approaches for a given problem.
5. apply different soft computing techniques to solve Engineering problems.

Special Remarks (if any)

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Syllabus for B. Tech in Electrical & Electronics Engineering (EEE)

(Applicable from the academic session 2018-2019)

Name of the course	**PRINCIPLE OF MANAGEMEENT**
Course Code: HM-EEE 701	**Semester: 7th**
Duration: 6 months	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 0 hr/week	Assignment & Quiz: 10 Marks
Practical: 0 hrs/week	Attendance: 05 Marks
Credit Points: 3	End Semester Exam: 70 Marks

Objective:

1.	To understand basic concept and approaches to management.
2.	To understand planning and decision making processes. .
3.	To understand organizational design and structure.
4.	To understand various aspects of leadership.

Pre-Requisite

1.	English (HM- HU 201)

Unit	Content	Hrs	Marks
1	**Concept & approaches to management:** Meaning & Definition of the term Management, Management as a Science or an Art, Management as a Profession, Management as a Process, Difference between Management & Administration; Levels of Management, Roles of a Manager, Quality of a good Manager, Significance of Management, Limitations of Management, Business Environment and its interaction with Management.	8	

	Approaches to Management – Classical, Neo-classical and Modern Contributors to Management Thought – Taylor and Scientific Theory, Fayol's and Administrative Theory, Peter Drucker and Management Thought. Various Approaches to Management (i.e. Schools of Management Thought) Indian Management Thought		
2	**Planning & decision making:** Planning: Meaning, Definition, Process, Types, Principles, Significance & Limitations of Planning; Strategic Planning – Meaning & Process, MBO – Meaning, Process and Requirements for Implementation, Planning Premises – Meaning & Types, Forecasting – Meaning & Techniques. Decision Making – Meaning, Types, Process, Significance & Limitations	8	
3	**Organization design & Structure:** Organization – Meaning, Process, Principles, Organization Structure – Determinants and Forms: Line, Functional, Line & Staff, Project, Matrix and Committees; Formal and Informal Organization; Departmentation – Meaning and Bases; Span of Control – Meaning and Factors Influencing; Authority, Responsibility and Accountability; Delegation – Meaning, Process; Principles; Centralization and Decentralization – Meaning; Degree of Decentralization; Difference between Delegation and Decentralization.	8	
4	**Directing:** Motivation – Meaning , Definition, Significance & Limitations; Financial and non-financial incentives of Motivation Leadership - Meaning, Definition, Significance of Leadership, Leadership styles Type, Process and Barriers of Communication, Strategies to overcome the Barriers.	8	
5	**Customer Management** – Market Planning & Research, Marketing Mix, Advertising & Brand Management. **Operations & Technology Management** – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.	8	

Text books:

1. Essentials of Management. H. Koontz and H. Weihrich , 7th Edition, Tata McGraw Hill
2. Principles of Management, Premvir Kapoor, Khanna Publishing House, 2019
3. Principles of Management - Text and Cases, Dipak Kumar Bhattacharyya. Pearson Education India, 2011.

Reference books:

4. Management-Text & Cases, V.S.P Rao & Hari V. Krishna, Excel Books, 2005
1. Principles of Management, T. Ramaswami, Himalaya Publishing House, 2014
2. Management of Technology and Operations, R. Ray Gehani, Wiley, 1998

Course Outcome: After completion of this course, the learners will be able to

1. explain the concepts and approaches of management.
2. demonstrate the roles, skills and functions of management.
3. diagnose and solve organizational problems.
4. identify the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.
5. apply different methods of Customer, Operation and Technology management.
6. acquire skills of good leader in an organization.

Special Remarks (if any)

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Syllabus for B. Tech in Electrical & Electronics Engineering (EEE)

(Applicable from the academic session 2018-2019)

Name of the course	**ANALOG AND DIGITAL COMMUNICATION LABORATORY**
Course Code: PC-EEE 791	**Semester: 7th**
Duration: 6 months	**Maximum marks:100**
Teaching Scheme	**Examination scheme:**
Theory: 0 hr/week	**Continuous Internal Assessment:40**
Tutorial: 0 hr/week	**External Assessment: 60**
Practical: 2 hrs/week	
Credit Points:1	

	Laboratory Experiments:
1.	Measurement of modulation index of an AM signal.
2.	Measurement of output power with varying modulation index an AM signal(for both DSB- & SSB).
3.	Measurement of distortion of the demodulated output with varying modulation index of an AM signal (for both DSB-SC & SSB).
4.	Measurement of power of different frequency components of a frequency modulated signal & the measurement of the bandwidth.
5.	Design and set up a PLL using VCO & to measure the lock frequency.
6.	Design and set up a FM demodulator using PL
7.	Study of PAM and demodulation.
8.	Study of PCM and demodulation.
9.	Study of line coders: polar/unipolar/bipolar NRZ ,RZ and Man
10.	Study of delta modulator and demodulator

11.	Study of BPSK modulator and
12.	Study of BFSK modulator a
13.	Study of ASK modulator and demodulator
14.	Study of QPSK modulator and demodulator.
15.	Simulation study of probability of symbol error for BPSKmodulation.

Institute may develop experiments based on the theory taught in addition to experiments mentioned.

Course outcome: After completion of this course, the learners will be able to

1. identify appropriate equipment and instruments for the experiment.
2. test the instrument for application to the experiment.
3. construct circuits with appropriate instruments and safety precautions.
4. apply different methods of modulations and demodulation in the laboratory.
5. analyse experimental data obtained in the laboratory.
6. work effectively in a team

Special Remarks: The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.