Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech Electrical and Computer Engineering
(Applicable from the academic session 2025-2026)

Name of the course	**BIOMEDICAL INSTRUMENTATION**
Course Code: PE-ECS 801A	**Semester: 8th**
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
Credit Points: 3	Attendance: 05 Marks
	End Semester Exam: 70 Marks

Objective:	
1.	To understand the fundamental of Medical Instruments
2.	To understand Biomedical recorders, Medical Imaging equipment, Surgical , Therapeutic Instruments and Medical Laboratory equipment.

Pre-Requisite	
1.	Analog Electronics
2.	Digital Electronics

Unit	**Content**	**Hrs**	**Marks**
1	**Fundamentals of Medical Instruments:** Fundamentals of medical instrumentation- Sources of biomedical signals, Generalized medical instrumentation block diagram. Medical electrodes - ECG, EEG, EMG, Defibrillator. Medical transducers: Body temperature, Blood pressure, respiration rate. Classification of Medical instruments based on application -(diagnostic, therapeutic, Imaging, analytical).	8	
2	**Biomedical Recorders:** Electrocardiograph (ECG) machine -ECG block diagram, Bipolar and unipolar leads, Phono-cardiograph. Electroencephalograph (EEG). 10-20 electrode placement system, EEG readout device, Electro-myograph (EMG) machine. Bio-feedback Instrumentation. Pulse Oximeter.	8	
3	**Medical Imaging Equipments:** X-ray machine, CT-Scan machine, MRI Scan machine, Properties of ultrasound, Ultrasonic foetal monitors. Echoencephalography. Echo-cardiograph. Colour Doppler ultrasound machine.	8	
4.	**Surgical & Therapeutic Instruments:** Electro-surgery machine (cautery), Hemo-dialysis machine Muscle stimulators, Defibrilator Machine	6	
5.	**Medical Laboratory Instruments:** Types of test - Blood cell, Bio chemistry, Blood Cell Counter, Bio chemistry analyze, Auto analyzer, Blood gas analyzer.	6	

Text book:

1. Handbook of Biomedical instrumentation, R. S. Khandpur, Tata McGraw Hill, New Delhi,2003
2. Introduction to Biomedical equipment technology, Joseph J. Carr and J.M. Brown, Pearsoneducation, New Delhi, 2000
3. Biomedical instrumentation measurements, Lesli P Cromwell, Fred J. Weibell, Erich A.Pfeiffer, PHI Learning, New Delhi, 2018

Reference books:

1. Medical instrumentation application & design, John G. Webster, Editor, John Wiley andSons, New Delhi, 2009
2. Introduction to Biomedical Instrumentation, Mandeep Singh, PHI, 2010

Course Outcome:

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

1. describe the principle of medical transducers for temperature, pressure and respiration rate.
2. explain the principle of operation of Biomedical recorders, Medical Imaging equipment Surgical & Therapeutic Instruments and Medical Laboratory Instruments.
3. use different medical laboratory equipment for different tests.
4. analyze any measurement application and suggest suitable measurement methods.
5. suggest suitable imaging methodology for a specific ailment.

Special Remarks:

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

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Name of the course	**UTILIZATION OF ELECTRIC POWER**
Course Code: PE-ECS 801B	**Semester: 8th**
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
Credit Points: 3	Attendance: 05 Marks
	End Semester Exam: 70 Marks

Objective:	
1.	To understand basic principle of illumination and good lighting practices
2.	To understand the method of Electric heating, Welding and Electrolytic processes.
3.	To understand the concepts of Electrical traction systems .
4.	To solve numerical problems on the topics studied.

Pre-Requisite	
1.	Electric Machine
2.	Control System
3.	Power Electronics and Drives

Unit	**Content**	**Hrs**	**Marks**
1	**Electric Traction:** Requirement of an ideal traction system, Supply system for electric traction, Train movement (speed time curve, simplified speed time curve, average speed and schedule speed), Mechanism of train movement (energy consumption, tractive effort during acceleration, tractive effort on a gradient, tractive effort for resistance, power & energy output for the driving axles, factors affecting specific energy consumption, coefficient of adhesion). Electric traction motor & their control: Parallel and series operation of Series and Shunt motor with equal and unequal wheel diameter, effect of sudden change of in supply voltage, Temporary interruption of supply, Tractive effort and horse power. Use of AC series motor and Induction motor for traction. Traction motor control: DC series motor control, Multiple unit control, Braking of electric motors, Electrolysis by current through earth, current collection in traction system, Power electronic controllers in traction system.	10	

2	**Electric Lighting:** Definition of terms; laws of illumination; Luminaries; Lighting requirements; Illumination levels; lamp selection and maintenance; Lighting schemes, calculations & design – Interior lighting – industrial, Factory, residential lighting; Exterior lighting - Flood, street lighting, lighting for displays and signaling - neon signs, LED-LCD displays beacons and lighting for surveillance; Energy Conservation codes for lighting; lighting Controls – daylight sensors and occupancy sensors; controller design.	8	
3	**Electric Heating :** Advantages of electrical heating, Heating methods, Resistance heating – direct and indirect resistance heating, electric ovens, their temperature range, properties of resistance, heating elements, domestic water heaters and other heating appliances and thermostat control circuit ,Induction heating; principle of core type and coreless induction furnace , Electric arc heating, direct and indirect arc heating, construction, working and applications of arc furnace, Dielectric heating, applications in various industrial fields, Infra-red heating and its applications, Microwave heating, Simple design problems of resistance heating Element.	8	
4.	**Electric Welding:** Advantages of electric welding, Welding methods, Principles of resistance welding, types –spot, projection seam and butt, welding and welding equipment used , Principle of arc production, electric arc welding, characteristics of arc, carbon arc, metal arc, hydrogen arc welding and their applications, Power supply required ,Advantages of using coated electrodes, comparison between AC and DC arc welding, welding control circuits, welding of aluminum and copper, Introduction to TIG, MIG welding.	8	
5.	**Electrolytic processes:** Need of electro-deposition, Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing, buffing, Equipment and accessories for electroplating, Factors affecting electro-deposition, Principle of galvanizing and its applications, Principle of anodising and its applications, Electroplating on non-conducting materials, Manufacture of chemicals by electrolytic process and electrolysis process.	6	

Text books:

1. Generation Distribution and Utilization of Electrical Energy, C.L. Wadhawa, New AgeInternational Publishers, 2015
2. Art and Science of Utilization of Electrical Energy, H. Partab, Dhanpat Rai & co, 2017
3. Utilisation of Electric Energy, E.Openahaw Taylor, Universities press, 1981

Reference books:

1. Generation and Utilization of Electrical Energy by S. Sivanagaruju, Pearson, 2010.
2. Utilization of Electrical Energy by J. B. Gupta, Rajeev Manglik, Rohit Manglik, KatariaPublications, 2012.

Course Outcome:

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

1. Explain the fundamentals of illumination and different lighting schemes.
2. Explain the fundamental of Electrolytic processes, Electric heating and Welding.
3. Able to select appropriate lighting, heating and welding techniques for specific applications.
4. Apply different electrolysis process for different applications.
5. Explain the principle of different aspect of Electric traction and control of traction motor.

Special Remarks:

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

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Name of the course	**CLOUD COMPUTING**
Course Code: **PE-ECS 801C**	Semester: 8th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: Nil	Assignment & Quiz: 10 Marks
Practical: Nil	Attendance: 05 Marks
Credit Points: 3	End Semester Exam: 70 Marks

Objective:	
1.	To provide fundamental knowledge of cloud computing and its architecture.
2.	To understand different service and deployment models in the cloud.
3.	To explore the technologies underlying virtualization and resource management.
4.	To analyze cloud platforms, services, and cloud security measures.
Pre-Requisite:	
1.	Computer Organization & Architecture (PC-ECS 406)
2.	Object-Oriented Programming (PC-ECS 405)
3.	Data Structures & Algorithms (PC-ECS 302)

Unit	Content	Hrs	Marks
1.	Definition of Cloud Computing and its Basics (Lectures). Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service Platform as a Service, Software as a Service with examples of services/ service providers, models – Infrastructure as a Service, Cloud Reference model, Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing, A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients, IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)	**10**	
2.	Use of Platforms in Cloud Computing Concepts of Abstraction and Virtualization Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P,	**12**	

	P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance,Concepts of Platform as a Service, Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks, Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service., Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service, Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services,		
3.	Cloud Infrastructure: Cloud Management: An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle). Concepts of Cloud Security: Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)	**9**	
4.	Concepts of Services and Applications : Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs, Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs	**9**	

	Cloud-based Storage: Cloud storage definition – Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services.		

Text books:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in cloud:Concept, Patterns and Projects, Moyer, Pearson
6. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India

Reference books:

Course Outcome:

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

1. Explain the fundamentals, architecture, and models of cloud computing.
2. Distinguish between different service and deployment models in the cloud.
3. Apply the concepts of virtualization and load balancing in cloud environments.
4. Explore and work with major cloud platforms such as Google Cloud and Microsoft Azure.
5. Identify key security challenges and solutions in cloud computing.
6. Understand the role of SOA and APIs in cloud-based application development.

Special Remarks:

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Name of the course	**CRYPTOGRAPHY AND NETWORK SECURITY**
Course Code: PE-ECS 802A	**Semester: 8th**
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
Credit Points: 3	Attendance: 05 Marks
	End Semester Exam: 70 Marks

Objective:

1	Understand computer security, types of attacks, and security principles.
2.	Learn cryptography techniques, including symmetric/asymmetric encryption and key algorithms (DES, IDEA, RSA).
3.	Explore internet security protocols, user authentication, email security, and firewall configurations.

Pre-Requisite:

1.	Computer Networks
2.	Mathematics

Unit	Content	Hrs	Marks
1	Attacks on Computers & Computer Security - Introduction, Need for Security, Security approaches, Principles of Security, Types of attack	5	
2	Cryptography: Concepts & Techniques- Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size	7	
3	Symmetric Key Algorithm - Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.	8	
4.	Asymmetric Key Algorithm, Digital Signature andRSA - Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).	5	

5.	Internet Security Protocols, User Authentication - Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.	6	
6.	Electronic Mail Security - Basics of mail security, Pretty Good Privacy, S/MIME.	4	
7.	Firewall - Introduction, Types of firewall, Firewall Configurations, DMZ Network	3	

Text book and Reference books:

1. "Cryptography and Network Security", William Stallings, 2nd Edition, Pearson EducationAsia
2. "Cryptography and Network Security" by V.K. Jain, Khanna Publishing House,
3. "Network Security private communication in a public world", C. Kaufman, R. Perlman and M. Speciner, Pearson
4. Cryptography & Network Security: Atul Kahate, TMH.
5. "Network Security Essentials: Applications and Standards" by William Stallings, Pearson.
6. "Designing Network Security", Merike Kaeo, 2nd Edition, Pearson Books
7. "Building Internet Firewalls", Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2ndEdition, Oreilly .
8. "Practical Unix & Internet Security", Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rdEdition, Oreilly

Course Outcome:

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

1. Identify and analyze various types of computer security threats and understand the principles and approaches for mitigating these risks.
2. Demonstrate the application of cryptographic techniques, including symmetric and asymmetric encryption, to secure data and communications.
3. Evaluate and implement symmetric key algorithms (like DES, IDEA, and RC5) and understand their strengths and weaknesses.
4. Explain and apply public-key cryptography, including RSA, digital signatures, and hash functions, in real-world scenarios.
5. Implement and assess security protocols for internet communication, user authentication, email security, and configure firewalls to protect networks.

Special Remarks:

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

Name of the course	**WEB AND INTERNET TECHNOLOGY**
Course Code: PE-ECS 802B	Semester: 8th
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
Credit Points: 3	Attendance:
	End Semester Exam: 70 Marks

Objective:	
1.	Understand internet structure, networking protocols (TCP/IP, IP addressing, routing), and web technologies (HTML, CSS, XML, CGI).
2.	Learn programming with PERL, JavaScript, Java applets, and client-server programming
3.	Explore network security techniques, threats, and protocols like SSL, SSH, and VPN.
4.	Study multimedia applications, VoIP, and search engine optimization (SEO).
Pre-Requisite:	
1.	**Computer Networks**
2.	**Web Development**

Unit	Content	Hrs	Marks
1	Introduction: Overview, Network of Networks, Intranet, Extranet and Internet. World Wide Web: Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. Review of TCP/I: Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing: Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IP tables. Internet Routing Protocol: Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast. Electronic Mail: POP3, SMTP.	**6**	
2	HTML: Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps: map, area, attributes of image area. Extensible Markup Language (XML): Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts: Introduction, Environment Variable, GET and POSTMethods.	**9**	
3	PERL: Introduction, Variable, Condition, Loop, Array, Implementing	**10**	

	data structure, Hash, String, Regular Expression, File handling, I/O handling. JavaScript: Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies: Definition of cookies, Create and Store a cookie with example. Java Applets: Container Class, Components, Applet Life Cycle, Update method; Parameter passing applet,Applications.		
4	Client-Server programming In Java: Java Socket, Java RMI.Threats Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial ofservice attacks. Network security techniques: Password and Authentication; VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL),Secure Shell (SSH). Firewall: Introduction, Packet filtering, Stateful, Application layer, Proxy.	**4**	
5	Internet Telephony: Introduction, VoIP. Multimedia Applications: Multimedia over IP: RSVP, RTP, RTCP and RTSP. Streaming media, Codec and Plugins, IPTV. Search Engine and Web Crawler: Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.	**5**	

Text book and Reference books:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters 1-5,7,8,9).
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning,Delhi, 2011. (Chapters 5,6,12)

Course Outcome:

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

1. Understand and explain internet architecture and key protocols like TCP/IP, IP addressing, and routing.
2. Demonstrate proficiency in web development using HTML, CSS, XML, and CGI scripting.
3. Apply programming concepts with PERL, JavaScript, and Java applets for client-server applications.
4. Evaluate and implement network security measures including SSL, SSH, VPN, and firewall techniques.
5. Analyze and utilize multimedia applications like VoIP and IPTV, along with search engine optimization (SEO) concepts.

Special Remarks:

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Name of the course	**SPEECH AND NATURAL LANGUAGE PROCESSING**
Course Code: PE-ECS 802C	**Semester: 8th**
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
Credit Points: 3	Attendance: 05 Marks
	End Semester Exam: 70 Marks

Objective:	
1.	Understand and apply Natural Language Processing (NLP) concepts, including tokenization, part-of-speech tagging, and language modeling techniques.
2.	Learn computational methods for text classification, sentiment analysis, and context-free grammar parsing**,** along with practical applications in information retrieval.
3.	Explore key algorithms and models, such as Hidden Markov Models, Naïve Bayes, and probabilistic language models, to solve NLP tasks effectively.

Pre-Requisite:	
1.	Mathematics and Probability Theory
2.	Computer Science Fundamentals

Unit	Content	Hrs	Marks
1	**Regular Expressions and Automata Recap** - Introduction to NLP, Regular Expression, Finite State Automata **Tokenization -** Word Tokenization, Normalization, Sentence Segmentation, Named Entity Recognition, Multi Word Extraction, Spell Checking – BayesianApproach, Minimum Edit Distance **Morphology -** Morphology – Inflectional and Derivational Morphology, Finite State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite State Transducers, Orthographic Rules and Finite State Transducers, Porter Stemmer	11	
2	**Language Modeling** Introduction to N-grams, Chain Rule, Smoothing – Add-One Smoothing, Witten-Bell Discounting; Backoff, Deleted Interpolation, N-grams for Spelling and Word Prediction, Evaluation of language models. **Hidden Markov Models and POS Tagging** Markov Chain, Hidden Markov Models, Forward Algorithm, Viterbi Algorithm, Part of Speech Tagging – Rulebased and Machine Learning based approaches, Evaluation.	9	

3	**Text Classification** Text Classification, Naïve Bayes' Text Classification, Evaluation, Sentiment Analysis – Opinion Mining and Emotion Analysis, Resources andTechniques. [4L] **Context Free Grammar** Context Free Grammar and Constituency, Some common CFG phenomena for English,Top-Down and Bottom-up parsing, Probabilistic Context Free Grammar, Dependency Parsing.	9	
4.	**Computational Lexical Semantics** Introduction to Lexical Semantics – Homonymy, Polysemy, Synonymy, Thesaurus – WordNet, Computational Lexical Semantics – Thesaurus based and Distributional Word Similarity [4L] **Information Retrieval** Boolean Retrieval, Term- document incidence, The Inverted Index, Query Optimization, Phrase Queries, Ranked Retrieval – Term Frequency – Inverse Document Frequency based ranking, Zone Indexing, Query term proximity, Cosine ranking, Combining different features for ranking, Search Engine Evaluation, Relevance Feedback [5L]	9	

Text book and Reference books:

1. Speech and Language Processing, Jurafsky and Martin, Pearson Education
2. Foundation of Statistical Natural Language Processing, Manning and Schutze, MIT Press
3. Multilingual Natural Language Processing Applications from Theory to Practice: Bikel, Pearson.

Course Outcome:

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

1. Apply NLP techniques like tokenization, named entity recognition, and part-of-speech tagging to process and analyze text.
2. Utilize language modeling methods such as n-grams, smoothing, and evaluation techniques for text prediction and correction tasks.
3. Implement machine learning algorithms like Naïve Bayes and Hidden Markov Models for text classification and sentiment analysis.
4. Understand and apply context-free grammar and probabilistic parsing methods to analyze sentence structure and dependencies.
5. Design and optimize information retrieval systems, using techniques like inverted indexing, ranking, and relevance feedback for effective search engine evaluation.

Special Remarks:

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Name of the course	**MOBILE COMPUTING**
Course Code: OE-ECS 801A	**Semester: 8th**
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
Credit Points: 3	Attendance: 05 Marks
	End Semester Exam: 70 Marks

Objective:

1.	Understand the architecture, mobility management, and network signalling in PCS, GSM, GPRS, and mobile data communication systems.
2.	Learn about mobile internet standards, WAP, WLANs, wireless local loop technologies, and 3G services.
3.	Explore emerging wireless technologies like Bluetooth, mobile satellite systems, and pervasive web applications with server-side programming.

Pre-Requisite:

1.	Basic Networking
2.	Programming

Unit	Content	Hrs	Marks
1	Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signaling. Global System for MobileCommunication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.	**5**	
2	General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.	**5**	
3	Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wirelessmark up Languages (WML). Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.	**7**	
4.	Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G	**7**	

5.	Global Mobile Satellite Systems; case studies of the IRIDIUM and LOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks,Blue tooth technology, Blue tooth Protocols.	**7**	
6.	Server-side programming in Java, Pervasive web application architecture, Device independent exampleApplication	**8**	

Text Books/ Reference Books:

1. "Pervasive Computing", Burkhardt, Pearson
2. "Mobile Communication", J. Schiller, Pearson
3. "Wireless and Mobile Networks Architectures", Yi-Bing Lin & Imrich Chlamtac, John Wiley& Sons, 2001
4. "Mobile and Personal Communication systems and services", Raj Pandya, Prentice Hall of India, 2001.
5. "Guide to Designing and Implementing wireless LANs", Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
6. "Wireless Web Development", Ray Rischpater, Springer Publishing,
7. "The Wireless Application Protocol", Sandeep Singhal, Pearson .
8. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers,
9. Brijesh Gupta “Mobile Computing”, Khanna Publishing House, New Delhi

Course Outcome:

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

1. Explain the architecture and mobility management in PCS, GSM, and GPRS systems, and understand their network signaling.
2. Analyze and compare wireless technologies like WLANs, WAP, and Bluetooth, and their role in mobile communication.
3. Understand 3G services and mobile satellite systems, including W-CDMA, CDMA 2000, and case studies like IRIDIUM and Globalstar.
4. Design and implement server-side applications for mobile and pervasive web environments, ensuring device independence.
5. Evaluate and implement quality of service in 3G networks and virtual wireless enterprise networks.

Special Remarks:

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Name of the course	**CYBER LAW AND ETHICS**
Course Code: OE-ECS 802B	**Semester: 8th**
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
Credit Points: 3	Attendance: 05 Marks
	End Semester Exam: 70 Marks

Objective:	
1.	Understand the fundamentals of intellectual property, including laws related to copyrights, patents, trademarks, and trade secrets.
2.	Explore the ethical, legal, and social implications of software development, information technology, and social networking.
3.	Analyze the impact of IT on productivity, quality of life, healthcare, and workplace ethics.

Pre-Requisite:	
1.	Basic Knowledge of IT and Law
2.	Software Development Fundamentals

Unit	Content	Hrs	Marks
1	Intellectual Property: Intellectual property, copyrights, patents, trade secrets and its laws, employees and trade secret, key intellectual property issues, plagiarism, reverse engineering, open source code, competitive intelligence, trademark infringement, cybersquatting.	8	
2	Software Development: Strategies for engineering quality software, importance of software quality, software product liability, software development process, capability maturity model integration, safety critical system, quality management standards.	8	
3	The Impact of Information Technology on Productivity and Quality of Life: Impact of IT, IT investment and productivity, digital divide, impact of it on healthcare cost, electronic health records, use of mobile and wireless technology in healthcare industry, telemedicine, medical information websites.	8	
4.	Social Networking: Social networking website, business Application of online social networking, social networking ethical issues: cyberbullying, cyber stalking, sexual predators, uploading inappropriate material. Online virtual world: crime in virtual world,	8	

	educational and business uses.		
5.	Ethics of IT Organization: Key ethical issues, non- traditional Workers, contingent workers, H-1 B workers, outsourcing, whistle blowing, green computing, ICT industry code of conduct.	8	

Text book and Reference books:

1. "Ethics in Information Technology", 4th Edition, George Reynolds Strayer University, 2012.
2. "Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing", 3rd Edition,Herman T. Tavani, John Wiley & Sons,2011.
3. "Information Technology Ethics: Cultural Perspectives", Soraj Honladarom, Charles Ess, Idea GroupInc (IGI), 2007

Course Outcome:

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

1. Identify and differentiate types of intellectual property and understand relevant legal issues such as plagiarism, reverse engineering, and cybersquatting.
2. Evaluate software development practices for quality assurance, legal liability, and adherence to industry standards.
3. Assess the impact of IT on productivity, healthcare, and the digital divide, including the role of mobile and wireless technologies.
4. Understand ethical concerns in social networking, including cyberbullying, stalking, and virtual crimes.
5. Analyze ethical issues in IT organizations, covering topics like outsourcing, non-traditional workers, whistle-blowing, and green computing.

Special Remarks:

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

Name of the course	**Blockchain Technologies**

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech Electrical and Computer Engineering
(Applicable from the academic session 2025-2026)

Course Code: OE-ECS-801C	Semester: 8th
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
Credit Points: 3	Attendance: 05 Marks
	End Semester Exam: 70 Marks

Objective:	
1.	Understand the fundamentals of blockchain technology and distributed ledger systems.
2.	Learn cryptographic techniques and consensus mechanisms used in blockchain networks.
3.	Develop smart contracts and decentralized applications (DApps).
4.	Explore blockchain use cases in finance, supply chain, and healthcare.
5.	Understand security, scalability, and regulatory aspects of blockchain.
Pre-Requisite:	
1.	Basic programming knowledge (Python, Java, or C++)
2.	Computer Networks
3.	Cryptography Fundamentals

Unit	Content	Hrs	Marks
1	**Introduction:** Evolution of blockchain technology, Centralized vs. decentralized vs. distributed systems. Key properties of blockchain: transparency, immutability, security. Types of blockchain: Public, Private, Consortium, Hybrid. Blockchain vs. Traditional Databases	5	
2	C**ryptographic Foundations:** Hashing functions (SHA-256, Keccak), Digital signatures and Public Key Cryptography (RSA, ECDSA), Symmetric vs. asymmetric encryption, Merkle Trees and their role in blockchain, Zero-Knowledge Proofs & Homomorphic Encryption (Brief Overview)	5	
3	**Blockchain Architecture & Consensus Mechanisms:** Structure of a block (Block Header, Transactions, Nonce, Hash), Mining and Proof-of-Work (PoW) mechanism, Proof-of-Stake (PoS), Delegated PoS, Proof-of-Authority (PoA), Byzantine Fault Tolerance (BFT), Proof-of-Burn (PoB), Proof-of-Space ,Blockchain forks: Soft forks, Hard forks	8	
4.	**Blockchain Platforms & Use Cases:** Bitcoin blockchain: UTXO model, Transaction validation. Ethereum blockchain: Account-based model, Gas fees. Hyperledger Fabric: Permissioned blockchain for	8	

	enterprises. Use cases: **Finance**: Cryptocurrency, DeFi, Stablecoins, **Supply Chain**: Provenance tracking, IBM Food Trust, **Healthcare**: Secure patient records, Vaccine distribution, **Identity Management**: Digital identity solutions		
5.	**Blockchain Scalability & Security:** Layer-1 vs. Layer-2 scaling solutions, Sidechains, State Channels, Plasma, Rollups, Blockchain security threats (51% attack, Sybil attack, DDoS), Regulatory challenges & compliance (GDPR, AML, KYC), Environmental concerns and energy-efficient consensus mechanisms	8	
6.	**Future Trends & Research Directions:** Cross-chain interoperability (Polkadot, Cosmos), Non-Fungible Tokens (NFTs) & Metaverse applications, Central Bank Digital Currencies (CBDCs), Quantum computing threats to blockchain, Web3, DAOs, and decentralized governance.	6	

Textbooks & Resources

1. "Mastering Blockchain" – Imran Bashir
2. "Blockchain Basics" – Daniel Drescher
3. Ethereum & Solidity Documentation (ethereum.org)
4. Bitcoin Whitepaper – Satoshi Nakamoto
5. Hyperledger Fabric Documentation (hyperledger.org)

Course Outcome:

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

1. Understand the core concepts of blockchain technology, including its evolution, architecture, types, and comparison with traditional databases.
2. Apply cryptographic principles such as hashing, digital signatures, and Merkle Trees to understand blockchain security and data integrity.
3. Analyze and compare various consensus mechanisms like PoW, PoS, BFT, and their impact on network security and performance.
4. Explore major blockchain platforms and real-world use cases across finance, supply chain, healthcare, and identity management.
5. Evaluate scalability solutions, security threats, and emerging trends like NFTs, Web3, DAOs, and the implications of quantum computing on blockchain systems.

Special Remarks:

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