EC501 | Electromagnetic Waves | 3L:0T:0P | 3 credits

Module I

6Hrs

Basics of Vectors, Vector calculus, Maxwell’s Equations, Basic laws of Electromagnetic, Poynting Vector, Boundary conditions at Media Interface.

Module II

8Hrs

Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wavepolarization, Poincare’s Sphere, Wave propagation in conducting medium, phase and group velocity, Surface current and power loss in a conductor Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

Module III

8Hrs

Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

Module IV

6Hrs

Wave propagation in parallel planewaveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.

Module V

6Hrs

Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna,

Text/Reference Books:

Maulana Abul Kalam Azad University of Technology, West Bengal  
(Formerly West Bengal University of Technology)  
Syllabus for B. Tech in Electronics & Communication Engineering  
(Applicable from the academic session 2018-2019)


Course Outcomes:
At the end of this course students will demonstrate the ability to
1. Understand characteristics and wave propagation on high frequency transmission lines
2. Carryout impedance transformation on TL
3. Use sections of transmission line sections for realizing circuit elements
4. Characterize uniform plane wave
5. Calculate reflection and transmission of waves at media interface
6. Analyze wave propagation on metallic waveguides in modal form
7. Understand principle of radiation and radiation characteristics of an antenna
Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs. Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.

Processor organization, Information representation, number formats.

Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats

Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit

Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory.

System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces

Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network

**Text/Reference Books:**

**Course Outcomes**
At the end of this course students will demonstrate the ability to
1. learn how computers work
2. know basic principles of computer’s working
3. analyze the performance of computers
4. know how computers are designed and built
5. Understand issues affecting modern processors (caches, pipelines etc.).
Syllabus for B. Tech in Electronics & Communication Engineering
(Applicable from the academic session 2018-2019)

<table>
<thead>
<tr>
<th>EC503</th>
<th>Digital Communication and Stochastic</th>
<th>3L:1T:0P</th>
<th>3.5 credits</th>
</tr>
</thead>
</table>

Mod-1  
*Introduction to Stochastic Processes (SPs):*
Definition and examples of SPs, classification of random processes according to state space and parameter space, elementary problems. Stationary and ergodic processes, correlation coefficient, covariance, auto correlation function and its properties, random binary wave, power spectral density.
Definition and examples of Markov Chains, transition probability matrix, Chapman-Kolmogorov equations; calculation of n-step transition probabilities.

Mod-2  
*Signal Vector Representation:*
Analogy between signal and vector, distinguishability of signal, orthogonality and orthonormality, basis function, orthogonal signal space, message point, signal constellation, geometric interpretation of signals, likelihood functions, Schwartz inequality, Gram-Schmidt orthogonalization procedure, response of the noisy signal at the receiver, maximum likelihood decision rule, decision boundary, optimum correlation receiver; probability of error, error function, complementary error function, Type-I and Type-II errors.

Mod-3  
*Digital Data Transmission:*
Concept of sampling, Pulse Amplitude Modulation (PAM), interlacing and multiplexing of samples, Pulse Code Modulation (PCM), quantization, uniform and non-uniform quantization, quantization noise, binary encoding, A-Law and μ-law companding, differential PCM, delta modulation and adaptive delta modulation.
Digital transmission components, source, multiplexer, line coder, regenerative repeater, concept of line coding – polar/unipolar/bipolar NRZ and RZ, Manchester, differential encoding and their PSDs, pulse shaping, Inter Symbol Interference (ISI), Eye pattern, Nyquist criterion for zero ISI, equalizer, zero forcing equalizer, timing extraction.

Mod-4  
*Digital Modulation Techniques:*
Types of Digital Modulation, coherent and non-coherent Binary Modulation Techniques, basic digital carrier modulation techniques: ASK, FSK and PSK.
Coherent Binary Phase Shift Keying (BPSK), geometrical representation of BPSK signal; error probability of BPSK, generation and detection of BPSK Signal, power spectrum of BPSK.  
Concept of M-ary Communication, M-ary phase shift keying, the average probability of symbol error for coherent M-aryPSK, power spectra of MPSK,  
Quadrature Phase Shift Keying (QPSK), error probability of QPSK signal, generation and detection of QPSK signals, power spectra of QPSK signals, Offset Quadrature Phase shift Queuing (OQPSK),  
Coherent Frequency Shift Keying (FSK), Binary FSK, error probability of BFSK signals, generation and detection of Coherent Binary FSK signals, power spectra of BFSK signal, Minimum Shift Keying (MSK), signal constellation of MSK waveforms, error probability of MSK signal, Gaussian Minimum Shift Keying: GMSK, basic concept of OFDM, constellation diagram,

Some performance issues for different digital modulation techniques - Error Vector Magnitude (EVM), Eye Pattern and Relative Constellation Error (RCE), Conceptual idea for Vector Signal Analyzer (VSA)

**Text Books:**
1) Digital Communications, S. Haykin, Wiley India.  
3) Wireless Communication and Networks : 3G and Beyond, I. SahaMisra, TMH Education.  

**References:**
2) Modern Digital and Analog Communication Systems, B.P.Lathi and Z.Ding, Oxford University Press.  

**Course Outcome:** At the end of this course students will demonstrate the ability to

1. understand the concept of Stochastic Process in Communication System  
2. represent various signals in different mathematical forms  
3. analyze baseband transmission mode of digital data  
4. analyze different career modulation techniques considering noise aspects
Module I

Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform and ROC, Analysis of LSI systems, frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT), Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems

Module II


Module III

Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multirate signal processing. Application of DSP.

Module IV

Origin of Wavelets, Classification(CWT & DWT), Filter Bank

Text/Reference Books:
Course Outcomes:
At the end of this course students will demonstrate the ability to
1. Represent signals mathematically in continuous and discrete time and frequency domain
2. Get the response of an LSI system to different signals
3. Design of different types of digital filters for various applications
Maulana Abul Kalam Azad University of Technology, West Bengal  
(*Formerly West Bengal University of Technology*)  
**Syllabus for B. Tech in Electronics & Communication Engineering**  
(Applicable from the academic session 2018-2019)

<table>
<thead>
<tr>
<th>EC591</th>
<th>Electromagnetic Wave Laboratory</th>
<th>0L:0T:2P</th>
<th>1 credits</th>
</tr>
</thead>
</table>

[At least THREE experiments from Module I and FOUR experiments from Module II]

**Module I:**
1. Plotting of Standing Wave Pattern along a transmission line when the line is open-circuited, short-circuited and terminated by a resistive load at the load end.
2. Input Impedance of a terminated coaxial line using shift in minima technique.
3. Study of Smith chart on Matlab platform.
4. Simulation study of Smith chart - Single and double stub matching.

**Module II:**
5. Radiation Pattern of dipole antenna.
6. Radiation Pattern of a folded-dipole antenna.
7. Radiation pattern of a 3-element Yagi-Uda Antenna.
9. Radiation pattern, Gain, Directivity of a Pyramidal Horn Antenna.
Design, implementation and study of all the properties of 7-length and 15-length pn sequences using shift register.

Study of PAM and demodulation.

Study of PCM and demodulation.

Study of line coders: polar/unipolar/bipolar NRZ, RZ and Manchester.

Study of delta modulator and demodulator.

Study of adaptive delta modulator and demodulator.

Study of BPSK modulator and demodulator.

Study of BFSK modulator and demodulator.

Study of ASK modulator and demodulator.

Study of QPSK modulator and demodulator.

Simulation study of probability of symbol error for BPSK modulation.

Simulation study of probability of symbol error for BFSK modulation.
Simulation Laboratory using standard Simulator:
1. Sampled sinusoidal signal, various sequences and different arithmetic operations.
2. Convolution of two sequences using graphical methods and using commands
   verification of the properties of convolution.
3. Z-transform of various sequences - verification of the properties of Z-transform.
4. Twiddle factors - verification of the properties.
5. DFTs / IDFTs using matrix multiplication and also using commands.
6. Circular convolution of two sequences using graphical methods and using commands,
   differentiation between linear and circular convolutions.
7. Verifications of the different algorithms associated with filtering of long data sequences
   and Overlap-save and Overlap-save methods.
8. Butterworth filter design with different set of parameters.
9. FIR filter design using rectangular, Hamming and Blackman windows.

Hardware Laboratory using DSP Processor and Xilinx FPGA:
COURSE OBJECTIVES:

- Build confidence in listening, speaking, reading and writing English professionally.
- Enable the students to think and speak effectively on everyday topics, including topics related to technical concepts.
- Equip students with the basics of Academic writing.
- Developing industry-ready attitude towards professional communication.
- Prepare for competitive exams like TOEFL, IELTS.

The classes need to be taken in ICT enabled classrooms, as well as in the Language lab.

Module-I:

Conversational Skills (6 hours)

1. General Conversation
   - **Warm-up sessions**
     Basics of Communication, verbal and non-verbal communication how to be a good speaker, effective body language.
     Practice sessions on:
     - Introducing oneself
     - Debates on topics like Is India really developing, Indian culture VS western culture, whether robots will overtake humans one day.
     - Just a Minute Sessions (JAMS)
     - Situational Dialogues and Role play: where students can enact everyday situations in their personal and professional lives

Module-II: (6 hours)

Intensive Practice Sessions

2.1 **Group Discussion** on topics like dangers of social media, is internet killing the print media, Artificial Intelligence, IOT, Cloud Computing, Cyber security
Module-III:

3.1 Organisational Writing (4 hours)
- Job application letter and CV writing
- E-Mail writing

3.2 Academic Writing (8 hours)
- Techniques for good Technical Writing: Academic Writing and Thesis writing
- Avoiding plagiarism
- Project Proposal
- Statement of Purpose
- Journal Articles

Module-IV: (6 hours)

4.1 Principles and practices of Personal Interview: (Practice sessions)
- Do’s and Don’ts of facing an interview.
- SWOC Analysis
- Rigorous practices of mock-interviews

Module-V:

Presentations (4 hours)
- Fundamentals of presentation skills
- Presentation sessions on Technical topics

Module-VI: (6 hours)
Preparation for T.O.E.F.L. and IELTS (Guidance and Practice sessions)
Maulana Abul Kalam Azad University of Technology, West Bengal  
(Formerly West Bengal University of Technology)  
Syllabus for B. Tech in Electronics & Communication Engineering  
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References:

Maulana Abul Kalam Azad University of Technology, West Bengal  
(Formerly West Bengal University of Technology)  
Syllabus for B. Tech in Electronics & Communication Engineering  
(Applicable from the academic session 2018-2019)

<table>
<thead>
<tr>
<th>PE-EC505A</th>
<th>Nano Electronics</th>
<th>3L:0T:0P</th>
<th>3 credits</th>
</tr>
</thead>
</table>


Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.),

Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics, Bandstructure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation

Text/Reference Books:
1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand various aspects of nano-technology and the processes involved in making nano components and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and the processes involved in making nano components and material.
4. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
Introduction- Speech production and modeling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques - parametric, waveform and hybrid; Requirements of speech codecs - quality, coding delays, robustness.

Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

Linear Prediction of Speech- Basic concepts of linear prediction; Linear Prediction Analysis of nonstationary signals - prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction.

Speech Quantization- Scalar quantization-uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization - distortion measures, codebook design, codebook types.

Scalar Quantization of LPC- Spectral distortion measures, Quantization based on reflection coefficient and log area ratio, bit allocation; Line spectral frequency - LPC to LSF conversions, quantization based on LSF.

Linear Prediction Coding- LPC model of speech production; Structures of LPC encoders and decoders; Voicing detection; Limitations of the LPC model.

Code Excited Linear Prediction- CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search - state-save method, zero-input zero-state method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP.

Speech Coding Standards- An overview of ITU-T G.726, G.728 and G.729 standards

Text/Reference Books:
Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBT- Treatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs (discrete and IC based). Concept of fast recovery and schottky diodes as freewheeling and feedback diode.

Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R, RL, RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.

Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers - TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper

Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter

Switching Power Supplies: Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant converter - series loaded half bridge DC-DC converter.


Text /Reference Books:
1. Muhammad H. Rashid, “Power electronics” Prentice Hall of India.
Maulana Abul Kalam Azad University of Technology, West Bengal  
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**Syllabus for B. Tech in Electronics & Communication Engineering**  
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**Course Outcomes:**
At the end of this course students will demonstrate the ability to
1. Build and test circuits using power devices such as SCR
2. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,
3. Learn how to analyze these inverters and some basic applications.
4. Design SMPS.
PE-EC505D | Scientific Computing | 3L:0T:0P | 3 credits

Introduction: Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy

Computer Arithmetic: Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating Point Arithmetic, Cancellation


Linear least squares: Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting

Eigenvalues and singular values: Eigenvalues and Eigenvectors, Methods for Computing All Eigenvalues, Jacobi Method, Methods for Computing Selected Eigenvalues, Singular Values Decomposition, Application of SVD

Nonlinear equations: Fixed Point Iteration, Newton’s Method, Inverse Interpolation Method

Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares

Interpolation: Purpose for Interpolation, Choice of Interpolating Function, Polynomial Interpolation, Piecewise Polynomial Interpolation

Numerical Integration And Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation,


Partial Differential Equations, Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods

Fast Fourier Transform, FFT Algorithm, Limitations, DFT, Fast polynomial Multiplication, Wavelets, Random Numbers And Simulation, Stochastic Simulation, Random Number Generators, Quasi-Random Sequences
Maulana Abul Kalam Azad University of Technology, West Bengal  
(Formerly West Bengal University of Technology)  
Syllabus for B. Tech in Electronics & Communication Engineering  
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Text/ Reference Books:

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand the significance of computing methods, their strengths and application areas.
2. Perform the computations on various data using appropriate computation tools.
OE-EC506A | Soft Skill and Interpersonal Communication | 3L:0T:0P | 3 credits

### UNIT I - SELF ANALYSIS
2 hours
SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

### UNIT II - CREATIVITY
3 hours
Out of box thinking, Lateral Thinking.

### UNIT III - ATTITUDE
3 hours
Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette.

### UNIT IV - MOTIVATION
2 hours
Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

### UNIT V - GOAL SETTING
4 hours
Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.

**Time management**
Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work.

### UNIT VII - INTERPERSONAL SKILLS
6 hours
**Gratitude**
Understanding the relationship between Leadership Networking & Team work. Assessing Interpersonal Skills Situation description of Interpersonal Skill.

**Team Work:** Necessity of Team Work Personally, Socially and Educationally

### UNIT VIII - LEADERSHIP
2 hours
Skills for a good Leader, Assessment of Leadership Skills

### UNIT IX - STRESS MANAGEMENT
4 hours
Causes of Stress and its impact, how to manage & distress, Circle of control, Stress Busters.

**Emotional Intelligence**
What is Emotional Intelligence, emotional quotient why Emotional Intelligence matters, Emotion Scales. Managing Emotions.

### UNIT X - CONFLICT RESOLUTION
2 hours
Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

### UNIT V - DECISION MAKING
4 hours
Importance and necessity of Decision Making, Process and practical way of Decision Making,
Weighing Positives & Negatives
Cyber World:
An Overview, The internet and online resources, Security of information, Digital signature

An Overview Cyber Law:
Introduction about the cyber space, Regulation of cyber space – introducing cyber law Scope of Cyber laws – ecommerce; online contracts; IPRs (copyright, trademarks and software patenting); e-taxation; e-governance and cyber crimes, Cyber law in India with special reference to Information Technology (Amendment) Act, 2008

IPR:

Intellectual Property: Issues and Challenges:
Geographical Indications, Layout designs of Integrated Circuits and Protection of Plant Varieties and Farmers’ Rights. Copyright protection with reference to performers rights and Artist rights, Global governance towards Patents, Trade Marks: Legal recognition, Comparative analysis in India, EU and USA, Trade secrets: Legal recognition, Comparative analysis in India, EU and USA

Intellectual Property: Contemporary Trends
Benefit sharing and contractual agreements – International Treaty on Plant Genetic Resources for Food and Agriculture – issues on patent policy and farmers’ rights- CBD, Nagoya Protocol and Indian law, UNESCO – protection of folklore/cultural expressions Developments in WIPO on traditional knowledge and traditional cultural expressions

Text Book
1. Duggal Pavan, Cyber Law - An exhaustive section wise Commentary on The Information Technology Act along with Rules, Regulations, Policies, Notifications etc. UNIVERSAL LAW PUBLISHING CO. PVT. LTD. C-FF-1A, Dilkush Industrial Estate, (Near Azad Pur Metro Station) G. T. Karnal Road, Delhi -110033, INDIA 2014

Reference Book
1. Intellectual Property Rights in India: General Issues and Implications Prankrishna Pal
Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Electronics & Communication Engineering
(Applicable from the academic session 2018-2019)


Course Outcome: At the end of the course, the students will be able to:
1. understand the role of intellectual property rights
2. identify the main types of intellectual property rights
3. understand the steps for successful registration and protection of intellectual property rights at national, regional and international levels
4. search patent and trademark databases
5. understand the legal aspects for intellectual property protection
OE-EC506C | Human Resource Management | 3L:0T:0P | 3 credits

UNIT-1-Human Resource Management:
Meaning & Definition, Functions, Scope & Objectives, Qualities of a HR Manager

UNIT-2-Human Resource Planning:

UNIT-3- Industrial Relations:
Concept & Meaning, Objective & Importance, Reasons of poor Industrial Relation. Industrial Disputes- Meaning & Definition, Causes of Industrial Dispute, Prevention of Industrial Dispute, Conditions for good Industrial Relation.

UNIT-4- Workers Participation in Management:

Text Book

Reference Book

Course Outcome: At the end of the course the students will be able to:
1. know the professional and personal qualities of a HR manager.
2. learn different methods of selecting human resources through recruitment, training and performance appraisal system.
3. 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.
4. know about consequence of industrial dispute and employee indiscipline of an organization.