Indian Institute of Information Technology Bhagalpur

Electronics and Communication Engineering (ECE)

B.Tech. Curricula and Syllabus

Semester-III

Curricula:

Course Code	Course name	L	T	P	C
MA201	**Engineering Mathematics III**	**3**	**1**	**0**	**4**
CS203	**Object Oriented Programming**	**3**	**0**	**0**	**3**
EC207	Analog Communication	3	0	0	3
EC201	Electromagnetic Theory	3	0	0	3
EC209	Measurement & Instrumentation	3	0	0	3
HS201	**Management Concepts and Technology**	**2**	**0**	**0**	**2**
CS211	Object Oriented Programming LAB	0	0	3	2
EC214	Analog Communication LAB	0	0	3	2
SAI	**Society Internship Program**	**0**	**0**	**0**	**1**

Syllabus:

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
MA201	Engineering Mathematics III	3	1	0	4	2nd	3rd
Topic	**Contents**						**No. of Lectures**
Module-I	Complex numbers and elementary properties. Complex functions - limits, continuity and differentiation. Cauchy-Riemann equations. Analytic and harmonic functions.						**08**
Module-II	Elementary functions. Anti-derivatives and path (contour) integrals. Cauchy-Goursat Theorem. Cauchy's integral formula, Morera's Theorem. Liouville's Theorem, Fundamental Theorem of Algebra and Maximum Modulus Principle. Taylor series. Power series. Singularities and Laurent series.						**09**
Module-III	Cauchy's Residue Theorem and applications. Mobius transformations; Partial Differential Equations: First order PDEs; solutions of linear and nonlinear first order PDEs; classification of second-order PDEs.						**08**
Module-IV	Method of characteristics Iin PDE; boundary and initial value problems (Dirichlet and Neumann type) involving wave equation, heat conduction equation, Laplace's equations and solutions by method of separation of variables; initial boundary value problems.						**08**
Module-V	Solution of PDE by Laplace transform; Fourier series, Fourier integrals; Fourier transforms, sine and cosine transforms; solution of PDE by Fourier transform.						**10**
						Total	**43**

Text	1. B S Grewal, J S Grewal, J K Dhanoa, *Higher Engineering Mathematics*, Khanna Publishers, 44th edition, 2017. 2. E. Kreyszig, H. Kreyszig, E. J. Norminton*, Advanced Engineering Mathematics,* 10th*,* Wiley India Pvt. Ltd., 2017
Reference	1. Ian N Sneddon, *Elements of Partial Differential Equations*, Dover Publications; 2006. 2. John H Mathews, Russell W Howell, *Complex Ananlysis for Mathematics and Engineering*, Jones and Bartlett India Pvt.Ltd, 6th edition, 2011. 3. James Ward Brown, Ruel V Churchill, *Complex Variables and Applications,* Tata McGraw Hill Education*, 8th edition, 2016.*

Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
CS203	Object oriented Programming	3	0	0	3	2nd	3rd

Course Objective: The course is designed to provide students with complete knowledge of Object Oriented. Programming through C++ and to enhance the programming skills of the students by giving practical assignments to be done in labs. The course also aims to provide students with requisite knowledge about Object Oriented Programming through C++ so that they make their own Applications/Projects using C++.

Topic		Hour
Module I	Principles of OOPs, Basics of C++, Functions in c++ : Basic Concepts of OOP, Benefits of OOP, OOP Languages, Applications of OOP. C++ program basics, data types, operators in c++, scope resolution, type cast operators, operator overloading, operator precedence. Main function, function prototyping, call by reference, inline functions, default arguments, constant arguments, function overloading, friend and virtual functions, maths library functions.	6
Module II	Classes, objects, constructors and destructors – C structures revisited, specifying a class, defining a member function, private member functions, memory allocation for objects, static data members and member functions, array of objects, objects as function arguments, friendly functions, returning objects, pointers to members, constructors, Parametrized constructors, Multiple constructors, Copy constructor, Destructors.	6
Module III	Operator overloading, inheritance, virtual functions and polymorphism – Overloading unary operators, overloading binary operators, rules for overloading operators, type conversions. Derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, virtual base classes, abstract classes, nesting of classes. Pointers, pointer to objects, this pointer, pointer to derived classes, virtual functions, pure virtual functions.	8
Module IV	Console I/O operations, working with files and templates – C++ streams and stream classes, unformatted I/O operations, formatted console I/O operations, managing output with manipulators. Classes for file stream operations, opening/closing of file, file pointers and their manipulation,	8

	error handling during file operation, command line arguments. Class templates, class template with multiple parameters, function templates, overloading template functions, member function templates, non-type template arguments.	
Module V	Exception handling and Standard template library – Basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing exception, specifying exception. Components of STL, Containers, Algorithms, Iterators, Application of Container classes, Functions objects.	6
	Total	34
Text	1. Object Oriented Programming with C; E Balagurusamy, ; 7th, McGraw Hill Education (India) Pvt. Limited; 2018. 2. The Complete Reference C++ (Indian Edition); Herbert Schildt, ; 4th, McGraw Hill Education (India) Pvt. Limited; 2017.	
Reference	1. The C++ Programming Language; Bjarne Stroustrup, ; 3rd, Pearson India Education Services Pvt.Ltd; 2017.	

Course Code	Course name	L	T	P	C	Year	Semester
EC207	Analog Communication	3	0	0	3	2nd	4th

Course objective: This course is intended to cover the basic principles and concepts of electronic communication systems. It includes theory and circuits of Amplitude modulation and Angle modulation. It covers sampling of analog signal and generation of PAM, PPM, PWM signals. Basic digital modulation techniques like ASK, FSK, PSK, PCM and DM are also included in the course. Performance of communication system in the presence of noise is also considered.

Topic	Contents	No. of Lectures
Module-I	Basic blocks in a communication system: transmitter, channel and receiver; baseband and pass-band signals and their representations; concept of modulation and demodulation	**04**
Module-II	Amplitude modulation (AM): - Time domain expression of baseband signal; modulation index, frequency domain (spectral) representations, phasor diagram, AM transmission bandwidth; AM for a single tone message- carrier and side band components; Transmission requirements for AM, normalized power and side band power. Double side band suppressed carrier modulation (DSB-SC) - time and frequency domain expressions; Transmission requirements for DSB, bandwidth and transmission power for DSB-SC; Generation of DSB-SC, square law modulators, balanced modulators, ring modulators, switching modulators. Single side band modulation (SSB):-Basic concept, SSB with suppressed/reduced carrier, advantages and generation of SSB; transmit band width and power, side band filter examples; Vestigial side band modulation (VSB)	**10**
Module-III	Demodulation of AM signals- square law and envelope detectors; The super heterodyne receiver for standard AM radio;	**10**

	Synchronous demodulation of AM, DSB and SSB using synchronous detection, Effects of frequency and phase errors in the local oscillator in DSB and SSB Demodulation of SSB with pilot carrier, use of SSB in telephony. Phase-Locked Loop (PLL):- Carrier recovery circuits, Basic operation of PLL , mathematical analysis, applications	
Module-IV	Angle Modulation (FM/PM): Instantaneous frequency instantaneous phase, time domain representation for FM and PM; Narrow band angle modulation with frequency and phase, modulation index, Phasor diagram; FM and PM signals for a single tone message, spectral representation, power and effective bandwidth; Generation of wide band FM using Armstrong method, commercial FM requirements. Detection of FM and PM signals, limiter discriminator; Demodulation of PM using PLL; FM broadcasting and stereo FM radio	**09**
Module-V	Noise Performance of Analog Communication Systems: Signal-to-noise ratio (SNR) in linear modulation, synchronous detection of DSB; SNR for AM, DSB and SSB; comparison of DSB, SSB and AM; Effect of noise in envelope and square law detection of AM, threshold effects in nonlinear detectors; SNR for FM, SNR improvement using pre-emphasis and de-emphasis. FM threshold effects; Comparison of linear and exponential modulation system for additive white band-limited noise channels.	**09**
	Total	**42**
Text	1. R. P. Singh, S. Sapre, *Communication Systems: Analog and Digital*, Tata McGraw Hill, 4th edition, 2017. 2. S. Haykin, *Communication Systems*, John Wiley & Sons, 4th edition, 2006.	
Reference	1. H. Taub and D. L. Schilling, and G. Saha, *Principles of Communication Systems*, Tata McGraw Hill, 4th edition, 2017. 2. G. Proakis and M. Salehi: *Communication Systems Engineering*, Pearson Education, 2nd edition, 2015.	

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
EC201	Electromagnetic Theory	3	0	0	3	2nd	4th

Course objective: The main objective of this course is to provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields. To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles such as fiber optics and electronic electromagnetic structures.

Topic	**Contents**	**No. of Lectures**
Module-I	Concept of coordinate system, Inter Coordinate Transformation, Differential length, Area and Volume, Line, Surface and Volume Integrals, Divergence Theorem, Stokes's Theorem, Static fields: Coulomb's and Gauss' laws for electrostatics, Poisson's and Laplace's equations; Biot-Savart's law, Gauss's and Ampere's laws for magnetostatics, Magnetic vector potential; Magnetic dipoles, Magnetization and behavior of magnetic materials.	**09**

Module-II	Maxwell's Equation: Maxwell's discovery, Maxwell's equations in point form and integral form, conversion of one form of Maxwell's equations on other form, displacement current, Faraday's law of electromagnetic induction	**08**
Module-III	Boundary Conditions: Fields in Media and Boundary Conditions, Boundary Conditions for Dielectric and Dielectric, Conductor and Dielectric, Conductor and Free Space; Method of images and boundary value problems; Equation of continuity, Boundary conditions for current density	**08**
Module-IV	Electromagnetic Fields: The wave equation, General form of wave equation for perfect dielectric conditions, Wave propagation in lossy dielectric medium, Wave propagation in good dielectrics, good conductor, Lossless dielectric and in free space. Power flow and pointing vector, Refection of uniform plane waves by perfect dielectric - Normal incidence, Oblique incidence	**09**
Module-V	Transmission Lines: Introduction; Line equations, Evaluation of propagation constant, Phase constant, Phase Velocity and characteristic impedance for lossless line and distortion less line, Design concept, Power handling capacity, Smith chart, The Terminated lossless line, Group Velocity, Dispersion	**08**
	Total	**42**
Text	1. M. N. O. Sadiku, *Elements of Electromagnetics*, Oxford University Press, 3rd edition, 2000. 2. N. Ida, *Engineering Electromagnetics*, Springer, 4th edition, 2020.	
Reference	1. K. E. Lonngren & S. V. Savov, *Fundamentals Electromagnetics with MATLAB*, PHI, 1st edition, 2005.	

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
EC209	Measurements & Instrumentation	3	0	0	3	2nd	3rd

Course objective: The main **objective** of this course is to provide an introduction to the field of **Instrumentation** and covers process variables and the various instruments used to sense, measure, transmit and control these variables.

Topic	**Contents**	**No. of Lectures**
Module-I	Definition of instrumentation. Static characteristics of measuring devices. Error analysis, standards and calibration. Dynamic characteristics of instrumentation systems; AC/DC current and voltage meters, ohmmeter; loading effect. Measurement of power and energy; Instrument transformers. Measurement of resistance, inductance, capacitance. ac/dc bridges.	**09**
Module-II	Measurement of non-electrical quantities: transducers classification; measurement of displacement, strain, pressure, flow, temperature, force, level and humidity; Instrumentation amplifier, isolation amplifier, and other special purpose amplifiers	**09**
Module-III	Electromagnetic compatibility; shielding and grounding. Signal recovery, data transmission and telemetry, Data acquisition and conversion.	**08**

Module-IV	Modern electronic test equipment: Oscilloscope, DMM, frequency counter, wave/ network/ harmonic distortion/ spectrum analyzers, logic probe and logic analyzer.	**08**
Module-V	Data acquisition system; PC based instrumentation, Programmable logic controller: ladder diagram. Computer controlled test systems, serial and parallel interfaces, Field buses. Smart sensors. Bio medical Instruments.	**08**
	Total	**42**
Text	1. A. D. Helfrick and W. D. Cooper, *Modern Electronic Instrumentation and Measuring Techniques*; Pearson Education, 1st edition, 1996. 2. E. O. Deobelin, *Measurement Systems - Application and Design*; Tata McGraw-Hill, 1st edition, 1990.	
Reference	1. B. M. Oliver and J. M. Cage, *Electronic Measurements and Instrumentation*, Tata McGraw-Hill, 1st edition, 1975.	

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
HS201	Management Concepts and Technology	2	0	0	2	2nd	3rd
Topic	**Contents**						**No. of Lectures**
Module-I	Principles of Management: Concept of Management, Functions of Management, Planning and its Nature &Organising, Designing organizational Structure, Authority relationships,						**04**
Module-II	Delegation of Authority. Staffing: Motivation and its Theory, Leadership Communication. Directing, Controlling & its techniques. Coordinating; Principles of Economic: Microeconomics: Concept of consumption, production, exchange, distribution.						**05**
Module-III	Demand analysis: Concept, kind of demand, change in demand, law of demand; Utility analysis: Marginal, total, consumer surplus, consumer equilibrium; Production analysis: Law of supply, different factors of production, law of returns, economies of scale.						**06**
Module-IV	Cost analysis: Cost concept, importance of cost behaviour, cost classification; Pricing analysis: Different kinds of markets, pricing & equilibrium in different markets - perfect, imperfect, monopoly.						**05**
Module-V	Income distribution: Briefing them about rent, wages, interest and profit. The international economics: Changing scenario, globalization, structural adjustment programme, stabilization policy, the multinational corporation. IBRD, IMF, GATT, WTO, ITO, IDA, IFC, MIGA.						**05**
	Total						**25**
Text	1. Business Organisation& Management - C.R Basu. 2. Essentials of Management - Harold Koontz, HeingWerhrich. 3. An introduction to Positive Economics; Lipsey. 4. Modern Microeconomics; A. Koutsoyiannis. 5. Managerial Economics - Analysis, Problems and Cases; P.L. Mehta. 6. Business Economics; ManabAdhikary.						