Department of Electronics and Communication Engineering

Proposed Curriculum Structure & Syllabi

of

B.Tech.

In

Internet of Things (IoT)

(w.e.f. 2023-2024)

Overall Credit Structure

Curriculum

Syllabus

Offered By

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M. M. M. UNIVERSITY OF TECHNOLOGY

GORAKHPUR-273010, UP

July-2023

PROPOSED OVERALL CREDIT STRUCTURE FOR B.TECH. PROGRAM

<table>
<tr><th colspan="4">Credit Courses</th></tr>
<tr><th colspan="2">Core Courses (CC)**</th><th colspan="2">Electives Courses (EC)**</th></tr>
<tr><th>Category</th><th>Min.Credits</th><th>Category</th><th>Min.Credits</th></tr>
<tr><td>Basic Sciences & Maths (BSM)</td><td>18</td><td>Program Electives (PE)</td><td>12</td></tr>
<tr><td>Engineering Fundamentals (EF)</td><td>18</td><td rowspan="2">Open Electives (OE) (Other Departments)</td><td>3</td></tr>
<tr><td>Professional Skill (PS)</td><td>4</td><td></td></tr>
<tr><td>Program Core (PC)</td><td>64</td><td>Humanities & Social Science elective (HSSE)</td><td>2</td></tr>
<tr><td>Management (M)</td><td>4</td><td></td><td></td></tr>
<tr><td>Humanities & Social Science (HSS)</td><td>6</td><td></td><td></td></tr>
<tr><td>Project (P)</td><td>5</td><td></td><td></td></tr>
<tr><td>Seminar (S)</td><td>2</td><td></td><td></td></tr>
<tr><td>Industrial Practice (IP)/ Industrial Elective (IE)</td><td>12</td><td></td><td></td></tr>
<tr><td>Program link basic science and engineering courses (PLBSE) (To be decided by the department)</td><td>15</td><td></td><td></td></tr>
<tr><td>Sub-total</td><td>148</td><td>Sub-total</td><td>17</td></tr>
<tr><td>Grand Total</td><td colspan="3">165</td></tr>
<tr><td colspan="4">** subjects to be taught for more than one branch may be scheduled both in odd and even semesters.</td></tr>
<tr><td colspan="3">1. Extracurricular Activities Courses (ECA)

Two compulsory courses from the following S.No (ii) to (v) non-credit courses:
(i) Induction Program (compulsory)
(ii) Skill development
(iii)Unity and Discipline (NCC or NSS)
(iv)Sports, Cultural, and Games
(v) Personality Development</td><td>Non-Credit</td></tr>
<tr><td colspan="3">2. *Audit Courses (AC)

Two of the Audit Courses are compulsory
<u>*Audit Courses</u>
1. Constitution of India
2. Indian Culture and Heritage
3. Indian Architecture
4. Indian Festivals
5. Vaidic Mathematics
6. Astronomy
7. Arts of India
8. Intellectual Property Right
9. Logical Research
10. Professional Ethics
11. Environmental Law</td><td>Non-Credit</td></tr>
</table>

12. Health Law 13. Human Rights 14. Basics of Human health and preventive medicine	

Minor Degree Courses (Optional) from any department	**Credits**
Department Minor (DM) Courses	18-20

Credit Structure for B. Tech. (IOT)

Category **Semesters**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**
Basic Sciences & Maths (BSM)	8	4	2	4	-	-	-	-	**18**
Engineering Fundamentals (EF)	5	8	5	-	-	-	-	-	**18**
Professional Skill (PS)	2	2	-	-	-	-	-	-	**4**
Program Core (PC)	-	-	10	18	13	14	9	-	**64**
Management (M)	-	-	-	-	2	2	-	-	**4**
Humanities & Social Science (HSS)	2	2	2	-	-	-	-	-	**6**
Humanities & Social Science Elective (HSSE)	-	2	-					-	**2**
Project (P)	-	-	-	-	-	2	3	0/4	**5/9**
Seminar (S)	-	-	-	-	-	2	-	-	**2**
Industrial Practice (IP)/ Industrial Elective (IE)#	-	-	-	-	-	-	-	12/8	**12/8**
Program link basic science and engineering courses (PLBSE) (To be decided by the department)	4	3	3	2	3		-	-	**15**
Program Electives (PE)	-	-	-	-	4	4	4	-	**12**
Open Electives (OE) (Other Departments)	-	-	-	-	-	-	3	-	**3**
Total	**21**	**21**	**22**	**24**	**22**	**24**	**19**	**12**	**165**

PROPOSED CURRICULUM FOR B.TECH. (IOT) PROGRAM

First Year, Semester I

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BSM-101	Calculus and Linear Algebra	3	1	0	4
2.	EF	BEE-101	Fundamentals of Electrical Engineering	3	1	2	5
3.	HSS	BHM-101	Professional Communication	2	0	0	2
4.	BSM	BSM-127	Engineering Physics	3	0	2	4
5.	PS	BEC-103	Electronic Component Testing and Measurement	0	0	4	2
6.	PLBSE	BIT-181	Computer Programming with C/C++	3	0	2	4
			Total	14	2	10	21
	ECA-I	ECA-100	Induction Program	-	-	-	0

First Year, Semester II

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BSM-156	Applied Probability and Statistics	3	1	0	4
2.	EF	BEC-151	Fundamentals of Electronics Engineering	3	1	2	5
3.	HSS	BHM-155	Engineering Economics	2	0	0	2
4.	EF	BEC-155	Introduction to IOT Devices and Applications	2	0	2	3
5.	PS	BEC-153	Electronic Workshop	0	0	4	2
6.	PLBSE	BEC-156	Introduction to Arduino Uno Programming	0	0	6	3
7.	HSSE	BHM-154	Human Values&Professional Ethics	2	0	0	2
			Total	14	2	10	21
	ECA-II	ECA-200		-	-	-	0

Second Year, Semester III

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BSM-227	Physics of IOT Sensors and Actuators	2	0	0	2
2.	EF	BEC-201	Digital Electronics and Computer Organization	3	1	2	5
3.	HSS	BHM-201	Scientific and Technical Writing	2	0	0	2
4.	PC	BIT-231	Introduction to Java Programming	3	0	2	4
5.	PC	BEC-203	Electronic Measurement and Instrumentation	2	1	0	3
6.	PC	BEC-204	Electronic Devices and Circuits	2	1	0	3
7.	PLBSE	BCS-205	Data Structure & Algorithms	2	0	2	3
			Total	16	4	4	22
	ECA-III	ECA-320		-	-	-	0
	AC	AUC-11		1/2	-	-	0

Second Year, Semester IV

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BSM-276	Principles of Electromagnetism and AntennaSystems	3	1	0	4
2.	PC	BEC-257	Computer Networks	3	1	0	4
3.	PC	BEC-252	Principles of Communication Systems	3	1	0	4
4.	PC	BEC-258	Introduction to Raspberry Pi Programming	3	0	4	5
5.	PC	BCS-258	Python for IOT	3	1	2	5
6.	PLBSE	BEC-255	Electronic Software Tools	1	0	2	2
			Total	16	5	6	24
	ECA-IV	ECA-401		-	-	-	0
	AC	AUC-09		1/2	-	-	0

Course Syllabus

Course Code: BSM-101	Calculus and Linear Algebra	
Course category	:	Basic Sciences &Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial:1, Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and two minor tests and one major theory examination.
Course Objectives	:	The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of basic differential operators in various engineering problems.
2. Understand the concepts of limit theory and nth order differential equations and their applications to our daily life
3. Solve linear system of equations using matrix algebra.
4. Know about qualitative applications of Gauss, Stoke's and Green's theorem.
5. To know the applications of double and triple integration in finding the area and volume.
6. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

UNIT-I	9
Differential Calculus: Limit, Continuity and Differentiability, Mean value theorems. Leibnitz theorem, Partial derivatives, Euler's theorem for homogenous function, Total derivative, Change of variable. Taylor's and Maclaurin's theorem. Expansion of function of two variables, Jacobian, Extrema of function of several variables.	
UNIT-II	9
Linear Algebra: Symmetric, Skew-symmetric matrices, Hermitian, Skew Hermitian Matrices, orthogonal and unitary matrices and basic properties, linear independence and dependence of vectors, Rank of Matrix, Inverse of a Matrix, Elementary transformation, Consistency of linear system of equations and their solution, Characteristic equation, Eigenvalues, Eigen-vectors, Cayley-Hamilton theorem, Diagonalization of matrices.	
UNIT-III	9
Multiple Integrals: Double and triple integrals, change of order of integration, change of variables. Application of multiple integral to surface area and volume. Beta and Gamma functions, Dirichlet integral.	
UNIT-IV	9
Vector Calculus: Gradient, Divergence and Curl. Directional derivatives, line, surface and volume integrals. Applications of Green's, Stoke's and Gauss divergence theorems (without Proofs).	

Text and Reference Books

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers
2. Erwin kreyszig: Advanced Engineering Mathematics, John Wiley & Sons.
3. R. K. Jain and Iyenger: Advanced Engineering Mathematics, Narosa Publications.
4. B.V. Ramana: Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd.,

Course Code: BEE-101/ 151		**Fundamentals of Electrical Engineering**
Course category	:	Engineering Fundamentals (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and two minor tests and one major theory & practical examination.
Course Objectives	:	**1.** To demonstrate and understand the basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context. **2.** To demonstrate and understand the basic concepts of analysis of simple DC and AC circuits, Magnetic Circuits, Transformers and Electrical Machines.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course:

1. Understand the basic properties of electrical elements, and solve problem based on basic electrical circuits & DC network theorems.
2. Understand the fundamental behaviour of AC circuits and solve AC circuit problems.
3. Apply the knowledge gained to explain the behaviour of the circuit at series & parallel resonance of circuit & the effect of resonance.
4. Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits
5. Explain construction and working principle of transformer with background of magnetic circuits.
6. Classify and compare different types of Electrical machines.

Topic Covered	
UNIT I **D C Circuit Analysis and Network Theorems:** Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power	**9**

Transfer theorem.	
UNIT II **Steady- State Analysis of Single-Phase AC Circuits:** AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasor, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and Parallel circuit Three Phase AC Circuits: Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power, and its measurement	**9**
UNIT III **Magnetic Circuit & Single-Phase Transformers:** Magnetic circuit, concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis, and eddy current losses. Single Phase Transformer: Principle of operation, Construction, EMF equation, Power losses, Efficiency, O.C & S.C Test and Introduction to auto transformer.	**9**
UNIT IV **Electrical Machines:** Concept of electromechanical energy conversion DC machines: Types, EMF equation of generators and torque equation of motor, Characteristics, and applications of DC Generators & motors. Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: Types, Principle of operation, Torque-slip characteristics, Applications	**9**
EXPERIMENTS 1. Verification of Kirchhoff's Law. 2. Verification of Norton's Theorem. 3. Verification of Thevenin's Theorem. 4. Verification of Superposition Theorem. 5. Verification of Maximum Power Transfer Theorem. 6. Verification of Series R-L-C circuit. 7. Verification of Parallel R-L-C circuit. 8. Measurement of Power and Power factor of three phase inductive load by two wattmeter method. 9. To perform O.C. and S.C. test of a single-phase transformer. 10. To draw the magnetization characteristics of separately excited dc motor. 11. To perform the external load characteristics of dc shunt motor.	
Text and Reference Books: 1. Fundamentals of Electric Circuits, C.K. Alexander and M.N.O. Sadiku; TATA McGraw-	

Hill.
2. Principles of Electrical Engineering, V. Del Toro; Prentice Hall International.
3. Electrical and Electronics Technology, Edward Hughes; Pearson.
4. Basic Electrical Engineering, D P Kothari, I.J. Nagarath; Tata McGraw Hill
5. Electrical Technology, B. L. Thareja and A. K. Thareja; S. Chand.

Course Code: BHM-101/151	**PROFESSIONAL COMMUNICATION**	
Course category	:	HSS
Pre-requisite Subject	:	None
Contact hours/week	:	Lecture: 2, Tutorial: 0, Practical: 0
Number of Credits	:	02
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, two minor tests and one major theory examination.
Course Objectives	:	To sensitize the students to understand the role & importance of communication for personal & professional success and enable learners to exhibit knowledge, skills, and judgment in and around human communication that facilitate their ability to work collaboratively with others in an interpersonal environment.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Use of various facets of communication skills, such as, Reading, Writing, Listening and speaking skills.
2. To identify, formulate and solve the real-life problems with positive attitude.
3. To inculcate the habit of learning and developing the communication and soft skills by practice.
4. To create an amicable ambience to make them learn the different part of English language with the correction of the language.
5. Enhancing word power by counselling scientific literature.
6. Focusing on effortless speaking and writing.

Topics Covered	
UNIT-I	6
VERBAL COMMUNICATION: Received Pronunciation; how to activate passive vocabulary; Technical/non-technical and Business Presentations; questioning and answer skills; soft skills for professionals; role of body postures, movements, gestures, facial expressions, dress in effective communication; Information/ Desk/ Front Office/ Telephone conversation; how to face an interview/press	

conference; Group discussions, debates, elocution.	
UNIT-II	
READING COMPREHENSION Skimming and Scanning; factual and inferential comprehension; prediction; guessing meaning of words from context; word reference; use and interpretation of visuals and graphics in technical writing.	6
UNIT-III	
WRITTEN COMMUNICATION: Note Making and Note Taking; summarizing; invitation, advertisement, agenda, notice and memos; official and commercial letters; job application; resume and curriculum vitae; utility, technical, project and enquiry reports; paragraph writing: General – Specific, Problem – Solution, Process – Description, Data – Comment.	6
UNIT-IV	
SHORT ESSAYS: Description and Argument; comparison and contrast; illustration; using graphics in writing: tables and charts, diagrams and flow charts, maps and plans, graphs; how to write research paper; skills of editing and revising; skills of referencing; what is a bibliography and how to prepare it.	6

Text and Reference Books

1. Bansal, R.K. & Harrison J.B., (1972) *Spoken English*, Orient Longman, India.
2. Chauhan, Narender Kr. & Singh, Sudhir N., (2013) *Formal Letters,* Pankaj Publication International, New Delhi.
3. Chhabra T.N., (2019) *Business Communication*, Sun India Publication, New Delhi.
4. Dixon Robert J., (1986) *Complete Course in English,* Prentice Hall of India, New Delhi.
5. Jones, Daniel., (2012) *Cambridge English Pronouncing Dictionary*, 18th Edition, Paperback, CUP, India.
6. Lewis, Norman, (2015) *Word Power Made Easy*, Penguin India.

BSM-127/177	**ENGINEERING PHYSICS**	
Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	Physics at 12th standard
Contact hours/week	:	Lecture: 3, Tutorial:0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and two minor tests and one major theory & practical examination.
Course Objectives	:	Understanding of the principle and concepts of Crystallography, Quantum Mechanics, Basic principles of electricity and magnetism, Maxwell's Equations, of and Advanced Materials for their applications Engineering.

Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Basics of crystallography and its applications in Engineering
2. Quantum Mechanics and its application to understand material properties at atomic level.
3. Basic principles of electricity and magnetism applied in Engineering.
4. Maxwell's equation of electromagnetic theory and its applications in engineering.
5. Basic principles of semiconducting materials and its application.
6. Basic Principles of advanced materials and their applications in Engineering.

Topics Covered

UNIT-I	9
Crystal Structures and X-ray Diffraction: Space lattice, basis, Unit cell, Lattice parameter, seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.	
UNIT-II	9
Quantum Mechanics: De Broglie waves and Group velocity concept, Uncertainty principle and its application, Davisson-Germer experiment, Derivation of Schrodinger equation for time independent and time dependent cases. Postulates of quantum mechanics, Significance of wave function, Application of Schrodinger wave equation for a free particle; Particle in a box (one dimensional)	
UNIT-III	9
Electrodynamics –I: Basic concepts of Gauss's law, Ampere's law and faradays law of electromagnetic induction. Correction of Ampere's law by Maxwell (concept of displacement current), Maxwell's equation, transformation from integral form to differential form, physical significance of each equation **Electrodynamics –II:** Maxwell's equation in free space, velocity of electromagnetic wave, transverse character of the wave and orthogonality of E, H and k vectors, Maxwell's equations in dielectric and conducting medium, velocity of e. m. wave, comparison with free space, penetration depth	
UNIT-IV	9
Physics of Advanced Materials Semiconducting Materials**,** Concept of energy bands in solids, concept of direct and indirect band gap, Carrier concentration and conductivity in semiconductors, Optoelectronic Materials, Superconducting Materials**,** Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Type I and Type II superconductors, BCS theory (Qualitative), Introduction of	

nanoscience and technology

EXPERIMENTS

1. To determine the specific resistance of a given wire using Carrey Foster's Bridge.
2. To study the variation of magnetic field along the axis of current carrying circular coil.
3. To study the Hall's effect and to determine Hall coefficient in n type Germanium.
4. To study the energy band gap of n- type Germanium using four probe method.
5. To determine e/m of electron using Magnetron valve.
6. To draw hysteresis curve of a given sample of ferromagnetic material.

Text and Reference Books

1. Introduction to Solid State Physics- Kittel , 7th edition, Wiley Eastern Ltd.
2. Solid State Physics - S. O. Pillai, 5th edition, New Age International.
3. Quantum Mechanics: Theory and Applications- AjoyGhatak, Tata McGraw-Hill
4. Introduction to Electrodynamics- David J. GriffithsPearson, New International Edition
5. Semiconductor Devices and Application - S.M. Sze, Wiley
6. Introduction to Nano Technology - Poole Owens, Wiley India
7. Engineering Physics by B. K. Pandey and S. Chaturvedi, 2e Cengage Learning Pvt. Limited, India

Course Code: BEC-103	**Electronic Component Testing and Measurement**	
Course category	:	Professional Skill (PS)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture:0, Tutorial: 0, Practical: 4
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through viva voce, practical work/record, attendance and major practical examination.
Course Objectives	:	The objective of this course is to identify different electronic components & to develop the understanding of different instruments.
Course Outcomes	:	After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

1. Able to identify electronics components.
2. Understanding of measuring instruments.
3. Able to demonstrate the measuring process using measuring instruments and components.
4. Able to execute the experiment based on DC bridges.
5. Able to examine the experiment performed on breadboard.
6. To study and analyze the signal using CRO and DSO.

Topics covered

List of experiments

Note: At least seven experiments should be performed

1. To identify the components which are used in electronic circuits.
2. To study the resistance, voltage, current measurement by using of multimeter.
3. To get familiarization and to study the operation of a function generator instrument and visualize the types of waveforms produced by a function generator.
4. To study the CRO and to find the Amplitude, phase difference and Frequency of a sinusoidal waveform using CRO.
5. Study of Lissajous patterns and measurement of frequency through Lissajous patterns
6. Measurement of low resistance using Kelvin's double bridge.
7. Measurement of medium resistance using Wheatstone bridge.
8. Measurement of time constant of RC circuit.
9. To study the bread board measurement and perform experiment no 2 on bread board.
10. To study the DSO and measure the amplitude, phase difference and frequency of sinusoidal waveform
11. Measure the values of capacitors using DMM and Schering bridge method.
12. Measure the values of inductors using Maxwell bridge method.
13. To Study of AC and DC Waveforms on CRO & DSO.
14. To study of classification and coding of capacitors-using numerals, directly printed values on capacitors, Ceramic capacitor and Electrolytic capacitor.
15. Measurement of h-parameters of CE configuration

Course Code: BIT-181	**Computer Programming with C/C++**	
Course category	:	Program link basic science and engineering courses (PLBSE) PLBSE
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous Assessment through Two Tests, Teacher Assessment (Quiz, Tutorial, Assignment, Attendance), Practical Work & Viva-voce, and One Major Theory &OnePractical Examinations.
Course Objectives	:	The course covers the basics of programming and demonstrates fundamental programming techniques, customs and terms including the most common library functions and the usage of the pre-processor. 1. To develop C/C++ Programs using basic programming constructs.

		2. To develop C/C++ programs using arrays and strings. 3. To develop applications in C using functions, structures and pointers.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge,skills, and attitudes after completing this course.

1. Basic terminology used in computer programming.
2. Programs development in C/C++ Language by writing, compiling and debugging.
3. Design of programs involving simple statements, conditional statements, iterative Statements.
4. Program with array, strings, functions, recursion, structure and union.
5. Dynamic memory allocations and use of pointers.
6. C++ Inheritance, functions and outputs.

Topics covered

UNIT-I

Basics of C: Introduction to programming language paradigms – Problem solving methods, Flowcharts and Algorithms Structure of a C Program, Variables, Identifiers, Keywords, Data Typesand Sizes, Constants, Declarations, Assignment & Intilization, Operators & Expressions, Precedenceand Order of Evaluation, Type Conversions.
Input and Output: Non- Formatted input & output, Formatted input & output.
Control Statements: Specifying Test Condition for Selection & Iteration, Conditional Execution &Selection, Iteration & Repetitive Execution, Goto Statement, Special Control Statements, NestedLoops.

UNIT-II

Arrays: One-Dimensional Array- Declaration, Initilization, Accessing Array Elements, Multi-Dimensional Array-Declaration, Initilization Unsized Array Initilization, Accessing Multi-DimensionalArrays, Linear Search and Binary Search, Selection and Bubble Sort.
Functions : Concept of Function, Using Functions, Parameter Passing techniques, Passing Arrays toFunctions, Scope & Extent, Storage Classes, Recursion.
C Preprocessor : #include, #define, #if, conditional compliliation.
Pointers : Pointers and Addresses, Address Operator, Declaring a Pointer, Initilizing the Pointer,Pointer Deferencing, Void Pointer, Null Pointer. Pointer and Function Arguments, Pointer Arithmetic,Arrays &Pointers, Pointers to Pointers, Implementing Multi Dimensional arrays using pointers,Command line arguments.

UNIT-III

Structures and Unions : Basics, Structure and functions, arrays of structures, Pointers to Structures,Self Referential Structure, Union and Enumeration Types.
Files : Basics and File Handling functions : Copy file and display file text Files.
Classes and data abstraction : Class scope, accessing class members, constructors, destructors,constant objects and member functions, this pointer, new and delete operators, Static DataMembers and Member Functions.

UNIT-IV

C++ : Introduction, simple program, standard library, header files, inline functions, references andreference parameters, default arguments, empty parameter lists, unary, scope resolution operator,function overloading.

C++ Inheritance : Base and derived classes, casting base class, pointers to derived class pointers,overriding, member functions, public, protected and private inheritance, constructors anddestructors in derived classes.

C++ Virtual Functions : Abstract base class, polymorphism, dynamic binding, virtual destructors.C++ Stream Input/Output : Streams, stream output, stream input.

C++ Templates : Introduction, class templates, templates and inheritance, templates and staticmembers.

C++ Exception Handling: Try, throw, catch.

List of experiments

Note: At least Eight experiments should be performed

1. Write programs to print statements in sequential order using simple printf, scanf input/output functions.
2. Write programs to implement if-else condition (simple as well as nested) on suitable problems.
3. Write program to implement switch-case conditional logic on suitable examples.
4. Write programs to implement for, while and do-while loop control statements on suitable problems.
5. Write programs to implement 1D & 2D array concepts on suitable problems such as sorting of elements, searching of element, matrix addition, subtraction, multiplication etc.
6. Write programs to implement string related concepts such as sorting of a string, finding its length, reversing, concatenation, comparing two strings etc.
7. Write programs to implement concept of user defined functions (call by value, call by reference, recursive calling etc.) on suitable examples.
8. Write programs to implement concepts of pointer.
9. Write programs to implement the concept of structure and union.
10. Write programs to implement dynamic memory allocation functions (calloc, malloc, free, realloc)
11. Write programs to implement file handling concepts such as reading from a file, writing to a file using file related functions (fclose, fopen, sscanf, sprint, fread, fwrite, getc, putc, getw, putw etc.)

Text books:

1. Object Oriented Programming with C++ : E. Balagurusamy, The McGraw-Hill
2. Let Us C++: Yesvant Kanetkar, BPB Publications
3. The C++ Programming Language: Bjarne Stroustrup, Addision Wasley.
4. Object Oriented Programming in C++ : Robert Lafore, Galgotia Publications.
5. Jeri R. Hanly and Elliot B. Koffman, Problem Solving and Program Design in C, 7th Edition, Pearson.

6. Schildt, Herbert, Complete Reference with C, Tata McGraw Hill.
7. Kerninghan and Ritchie, The C programming Language, 2nd Edition, Prentice Hall.
8. Richard Bird, Introduction to Functional Programming using Haskell, 2nd Edition, PrenticeHall International, 1998.

Reference Books :

1. Raja Raman, Computer Programming in C, PHI Learning, 2013.
2. Bhushan Trivedi, Programming with ansi C++, Second edition, Oxford University Press, 2012.
3. Greg Michaelson, An Introduction to Functional Programming Through Lambda Calculus, Dover Edition, Addition Wesley Publication.
4. 4. Samuel P. Harbison, and Guy L. Steele Jr., C-A Reference Manual, Fifth Edition, Prentice Hall, 2002. BSM-129

BEC-101/ 151	**FUNDAMENTALS OF ELECTRONICS ENGINEERING**	
Course category	:	Engineering Fundamentals (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and two minor tests and one major theory & practical examination.
Course Objectives	:	The objective of this course is to gain knowledge of basic electronic components and develop the understanding of the working principle of different electronic devices such as voltmeter, multimeter, CRO, etc.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to memorize the basic concept of electronic circuits using Diode, BJT, FET, etc.
2. Able to execute and examine the general characteristic of electronic circuits.
3. Illustrate the basics of Boolean algebra and logic gates with their realisation using discrete electronic components.
4. Compute different parameters for characterising different circuits like rectifier, amplifiers, integrators, etc.
5. Examine the working principle of digital voltmeter, multimeter using block diagram approach.
6. Discuss and calculate voltage, current, phase and frequency using CRO.

Topics Covered

UNIT-I

Semiconductor materials and properties: electron-hole concepts, Basic concepts of energy bands in materials, concept of forbidden gap, Intrinsic and extrinsic semiconductors, donors and acceptors impurities, Junction diode, p-n junction, depletion layer, v-i characteristics, diode resistance, capacitance, diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage). Diode Applications in rectifier, filters, voltage multipliers, load regulators, clipper and clamper circuits, Breakdown mechanism (Zener and avalanche),Breakdown characteristics, Zener resistance, Zener diode ratings, Zener diode application as shunt regulator	9
UNIT-II	
Transistors (BJT); Basic construction, transistor action, CB, CE and CC configurations, input/output characteristics, Biasing of transistors-fixed bias, emitter bias, potential divider bias, comparison of biasing circuits. Transistor Amplifier: Graphical analysis of CE amplifier, concept of voltage gain, current gain, h- parameter model (low frequency), computation of Ai, Av, Ri, Ro of single transistor CE and CC amplifier configurations.	9
UNIT-III	
Field Effect Transistors(JFET and MOSFET): Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristic equation CG, CS and CD configurations, fixed & self-biasing. MOSFET: depletion and enhancement type MOSFET - construction, operation and characteristics. Computation of Av, Ri, Ro, of single FET amplifiers using all the three configurations **Switching theory and logic design**: Number systems, conversion of bases, Boolean algebra, logic gates, concept of universal gate, canonical forms, Minimization using K-map	9
UNIT-IV	
Operational Amplifiers andElectronics Instruments: Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integratorsWorking principle of digital voltmeter, digital multi-meter (block diagram approach), CRO (its working with block diagram), measurement of voltage, current, phase and frequency using CRO	9
EXPERIMENTS **Note: Minimum Five experiments are to be performed** 1. To plot the forward / Reverse Characteristics of Si P-N junction diode. 2. To plot the forward / Reverse Characteristics of Zener diode 3. Study and plot the characteristic of Zener diode as voltage regulator 4. Study of half wave rectifier and draw the nature of input / output signal. Calculate the value of Idc, Irms and ripple factor. 5. Study of Full wave rectifier and draw the nature of input / output signal. Calculate the	

value of Idc, Irms and ripple factor.

6. Study of Bridge Rectifier and draw the nature of input / output signal. Calculate the value of Idc, Irms and ripple factor.
7. Draw input output characteristic curve of n-p-n transistor in CE configuration
8. Draw input output characteristic curve of n-p-n transistor in CB configuration
9. Draw the drain and transfer curve of JFET
10. Study of OPAMP (741) and calculate the gain in (i)Inverting mode and (ii)Non-inverting mode
11. Study of OP-AMP as a (i) Summer (ii) Integrator (iii) Differentiator; and plot the nature of input & output waveform
12. Study of CRO and multi-meter measurement voltage, frequency, phase difference using CRO along with the testing of electronics component

Text and Reference Books

1. Electronic Devices and Circuits-Boylestad and Nashelsky, 6e, PHI, 2001
2. Electronic Devices and Circuits, A Mottershead, PHI,2000, 6e
3. Digital Computer Design, Morris Mano, PHI,2003
4. Electronic Instrumentation-H.S. Kalsi, 2e,TMH, 2007

BHM-155	**ENGINEERINGECONOMICS**	
Coursecategory	:	HSS
Pre-requisiteSubject	:	NIL
Contact hours/week	:	Lecture:2,Tutorial:0,Practical:0
Numberof Credits	:	2
Course Assessment methods	:	Continuousassessmentthroughattendance,homeassignments, quizzesandtwominortests andonemajortheoryexamination.
Objectives	:	Enablestudentstounderstandthefundamentaleconomicconcepts applicable to engineering
Course Outcomes	:	Thestudents are expected tobe abletodemonstratethefollowing knowledge,skillsandattitudesaftercompletingthiscourse

1. StudentswillacquirebasicknowledgeinEngineeringEconomics,whichallowsstudentsto gain theoretical and empirical skill of Economics.
2. TodevelopthebasicunderstandingofMicroeconomicsandMacroeconomicsandits application to decision making and Managerial Economics.
3. Becomeacquaintedwithbasiceconomicconceptssuchasdemandandsupplyand Elasticity of Demand.
4. Todevelopa significantunderstanding ofvarious conceptsof cost.
5. Todeveloptheabilitytounderstand thevariouskindsofmarket structure.
6. Todeveloptheabilitytoacquirethe knowledgeofNationalIncomeandits measurement.

TopicsCovered

UNIT-I	
Introduction:Meaning,NatureandScopeofMicroEconomics,MacroEconomicsand Managerial Economics, Decision making Process with reference to Managerial economics, Managerial Economics and its application in engineering perspective.	6

UNIT-II	
ConceptsofDemandandSupply:DemandAnalysis,LawofDemand,Determinantsof Demand, Elasticity of Demand: Price, Income and cross Elasticity. Uses of concept of elasticity of demand in managerial decision, Law of Supply.	6
UNIT-III	
Productionfunction,Overviewofcost:fixedcost,variablecost, averagecost,marginal cost,opportunitycost, Anover-viewofshort and long runcost curves.	6
UNIT-IV	
MarketStructure:PerfectCompetition,Imperfect competition–Monopolistic,Oligopoly, Monopoly,NationalIncome:ConceptandMeasurementofNationalIncome.	6
TextBooks &References	
1. Mote,PaulandGupta, ManagerialEconomics, TM H,NewDelhi. 2. HLAhuja,Managerial Economics,SChand &Co.New Delhi 3. P.L.Mehta,ManagerialEconomics,Analysis,ProblemsandCases,SultanChand Sons, New Delhi. 4. Prof.D.N.Kakkar,ManagerialEconomicsforEngineering,PHIpublication,New Delhi 5. Varshney andMaheshwari,ManagerialEconomics,SultanChandandSons,NewDelhi.	

BEC-155	**IntroductiontoIoTDevicesandApplications**	
Coursecategory	:	EngineeringFundamentals(EF)
Pre-requisiteSubject	:	NIL
Contact hours/week	:	Lecture:2,Tutorial:0,Practical:2
Numberof Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments,quizzes,practicalwork,record,vivavoiceand2-Minor testsandOneMajor Theory&Practical Examination.
Objectives	:	1. TounderstandtheconceptsofInternetofThingsandthe application of IoT. 2. ToDeterminetheMarket perspectiveof IoT. 3. ToUnderstandthevisionof IoTfromaglobal context.
Course Outcomes	:	Thestudentsareexpectedtobeabletodemonstratethefollowing knowledge,skillsandattitudesaftercompletingthiscourse.
1. UseofDevices,Gateways andDataManagementin IoT. 2. DesignIoTapplicationsindifferentdomain andbeabletoanalysetheirperformance 3. ImplementbasicIoTapplicationsonembeddedplatform. 4. Usingsensor-enabled IoTsystemslikeTraffic,HumidityandTemperature. 5. Real-timedataontheproduct'slocationandtransportationisprovidedthroughIoT. 6. IoTsupplychainsystemcapturesdataonvehiclethatpromptsautomatedcondition modification.		
TopicsCovered		
UNIT-I		

IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	8
UNIT-II	
M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoTValueChains,AnemergingindustrialstructureforIoT,Theinternationaldrivenglobal valuechainandglobalinformationmonopolies. M2Mto IoT-AnArchitecturalOverview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	8
UNIT-III	
IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views, IoT Applications for Value CreationsIntroduction,IoTapplicationsforindustry:FutureFactoryConcepts,Brownfield IoT.	8
UNIT-IV	
SmartObjects,SmartApplications,FourAspectsinyourBusinesstoMasterIoT,Value CreationfromBigDataandSerialization,IoTforRetailingIndustry,IoTforOilandGas	8
Industry,OpinionsonIoTApplicationandValueforIndustry,HomeManagement,eHealth. Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security,PrivacyandTrustinIoT-Data-PlatformsforSmartCities,SmartieApproach.Data Aggregation for the IoT in Smart Cities.	
EXPERIMENTS **Note:Minimumeightexperimentsaretobeperformed** 1. ControllingtheLightEmittingDiode(LED)withapush button. 2. Tointerfaceof IRSensor withArduinoandwrite aprogramtodetectan object. 3. ToInterfacetheRGBLEDwiththe Arduinoandwriteaprogramtoturnon LED. 4. ControllingtheLEDblinkratewiththepotentiometerinterfacingwithArduino. 5. Interfacingof DHT11temperature/Humidity sensorLM35with Arduino. 6. InterfacingServoMotorwiththeArduinoandwriteaprogramwithangleof deflection. 7. InterfacingoftheActiveBuzzerwithArduinoandwriteaprogramtoturnonBuzzer at each 3 seconds. 8. InterfacingoftheRelay withArduinoandwriteaprogramtoturnon serialmonitor 9. BuildingIntrusionDetectionSystemwithArduinoandUltrasonicSensor. 10. DirectionalControl of theDC motor using Arduino.	
TextBooks &References	

1. VijayMadisettiandArshdeep Bahga,"InternetofThings:(AHands-onApproach)", Universities Press (INDIA) Private Limited 2014, 1st Edition.
2. MichaelMiller,"TheInternetofThings:HowSmartTVs,SmartCars,SmartHomes, and Smart Cities Are Changing the World", Pearson Education 2015.
3. FrancisdaCosta,"RethinkingtheInternetofThings:AScalableApproachto Connecting Everything", Apress Publications 2013, 1st Edition.
4. WaltenegusDargie,ChristianPoellabauer,"FundamentalsofWirelessSensorNetworks: Theory and Practice", Wiley 2014.

WebReferences

https://github.com/connectIOT/iottoolkit
https://www.arduino.cc/http://www.zettajs.org/

Course Code: BEC-153	**ELECTRONIC WORKSHOP**	
Course category	:	Professional Skills (PS)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture:0, Tutorial: 0 , Practical: 4
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through attendance, practical work, record, viva voce, and practical major examination.
Course Objectives		The objective of this course is to develop the skill and working of different circuit board & prototypes of the designed electronics circuits.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. To identify the circuit components and their application specially for electronics PCB design.
2. Understand the design processes and production methods used in the manufacturing of a printed circuit board.
3. Understand the use and application of chemical itching and drilling in the manufacture of an electronic circuit.
4. Be able to design and manufacture a prototype printed circuit board and use it to assemble and test an electronic circuit.
5. Able to design rectifier and filter and study their practical applications.
6. Able to have knowledge of these circuits using breadboard.

List of Experiments

Note: Minimum Seven experiments should be performed

1. Winding shop: Step-down transformer winding of less than 5VA.
2. Soldering shop: Fabrication of DC regulated power supply.
3. Printing of circuits on PCB.

4. Design a PCB using Etching & drilling. 5. Coating of etched PCB to protect it from oxidation. 6. Convert the power supply circuit into PCB & simulates its 2D & 3D view. 7. Design a full wave center tapped rectifier & study the effect of capacitive filter & it's output on a virtual oscilloscope. 8. Design a RLC resonance circuit & verify the transient & phase response for different values of R, L&C. 9. Assemble electronic circuit/system on general purpose PCB, test and show the functioning. 10. Construct various electronic circuits on breadboard 11. Identify and test different types of ICs. 12. To study the specifications and working of a Transistor radio kit and perform measurements on it. 13. Study the working of Distortion Meter. 14. To study the working of Spectrum analyzer and determine the bandwidth of different signals.	
Text and Reference Books	
1. Electronics Components and Materials by SM Dhi, Tata McGraw Hill, New Delhi 2. Electronics Device and circuits by Millman and Halkias; McGraw Hill. 3. Principle of Electronics by Albert Paul Malvino; Tata McGraw Hill.	

BEC-156	**IntroductiontoArduinoUnoProgramming**	
Coursecategory	:	PLBSE
Pre-requisiteSubject	:	NIL
Contact hours/week	:	Lecture:0,Tutorial:0,Practical:6
Numberof Credits	:	3
Course Assessment methods	:	Continuousassessment,attendance,quizzes,practicalwork,record, vivavoiceandPracticalExamination.
Objectives	:	1. In this course students will learn how the Arduino platform works in terms of the physical board and libraries and the IDE (Integrated Development Environment). 2. ThiscoursewillalsofamiliarArduinoUnobasedEmbedded system design, their programming with python and C code and accessing the pins on the board via the software to control external devices.
Course Outcomes	:	Thestudentsareexpectedtobeabletodemonstratethefollowing knowledge,skillsandattitudesaftercompletingthiscourse.

1. Studentswillacquirebasic knowledgeinArduinobasedEmbeddedSystemDesign.
2. TodevelopthebasicunderstandingofMicrocontrollers,Actuator,Sensor,andMotorsin various applications.
3. To develop a significant understanding of how to connect relays LED, LCD, IR, Ultrasonic sensor and servomotors to ARDUINO Board.
4. Design IoT applications in different domain like Filters, resistors, LCD displays etc., and be able to analyze their performance.
5. To understand the basic concept of UART/USART communication.
6. To understand the basic concept of I2C communication.

EXPERIMENTS

Note:Minimum Eight experimentsaretobeperformed.

1. Withthehelp ofArduinoUno/Raspberypi, howtobuildan LEDbinary counter.
2. With the help of Arduino Uno/Raspbery pi, how to read Analog voltage from theserial monitor.
3. TointerfaceofIRSensorandServomotorwithArduinoandwriteaprogramto detect an object.
4. Withthehelp ofArduinoUno/Raspberypi, howto designsimplecircuitofOhm's lawandwrite aprogramalso.
5. With the help of Arduino Uno/Raspbery pi, how to work Push button as a Toggle switch.
6. ControllingtheLEDblinkratewiththepotentiometerinterfacingwithArduino.
7. InterfacingofDHT11temperature/HumiditysensorLM35withArduino.
8. WiththehelpofArduinoUno/Raspberypi,howto designportabletemperatureand humidity sensor with DHT 11.
9. WiththehelpofArduinoUno/Raspberypi,howtodesignserialtoparallelshift resistor with 74HC595.
10. WiththehelpofArduinoUno/Raspberypi,howtodesignCircular shiftleftand circular shift right with 74HC595.
11. WiththehelpofArduinoUno/Raspberypi,howtodesignaportabledistance detector with Ultrasonic sensor.
12. InterfacingoftheActiveBuzzerwithArduinoandhowtochangetheirtoneandwrite a program to turn on Buzzer at each 3 seconds.
13. WiththehelpofArduinoUno/Raspberypi,howto designBinaryandHexadecimal Bit Flipper.
14. Interface UART /USART communication for exchanging serial data between two devices.
15. Interface Inter Integrated Circuit (I2C) for serial communication between two devices.

TextBooks &References

1. Arduino-Based Embedded Systems : By Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury.
2. https://www.arduino.cc/en/Tutorial/HomePage
3. ArduinoMadeSimplebyAshwin Pajankar
4. EmbeddedC,Pont,MichaelJ
5. ARM System Developer's Guide - Designing and OptimizingSystem Softwareby: Andrew NSloss, Dominic Symes, Chris Wright; 2004, Elsevier
6. ARMSystem-On-ChipArchitecture,Furber,Steve
7. AssemblyLanguageProgramming: ARM Cortex-M3:Mahout, Vincent

BHM-154	HUMANVALUES&PROFESSIONALETHICS-1	
Coursecategory	:	HSS
Pre-requisiteSubject	:	None
Contact hours/week	:	Lecture:2,Tutorial:0,Practical:0
Numberof Credits	:	2
Course Assessment methods	:	Continuousassessmentthroughattendance,homeassignments, quizzesandtwominortestsandonemajortheory examination.
CourseObjectives	:	To give basic insights and inputs to the students to inculcate Human valuestogrowasaresponsiblehumanbeingwithholisticpersonality and enable them to understand and appreciate versatility and universalityofhumanvaluesandtheirpivotalroleinprofessional field.
CourseOutcomes	:	Thestudentsareexpectedtobeabletodemonstratethe following knowledge,skillsandattitudesaftercompletingthiscourse

1. Tocreateconduciveenvironmentforprofessionalstogrowasgoodandresponsiblehuman beings imbibing values and ethics.
2. Understandingthesignificanceofenvironment.
3. Developinghumanitarianoutlook.
4. Abletounderstandnatureoftheindividualandlegalaspectsofenvironment.
5. Understandinggmajorideas,values,beliefs,andexperiences.
6. Theseissueswillhelptosensitisestudentstobebroadertowardsthesocial,culturaland human issues involved in social changes.

TopicsCovered

UNIT-I	
Origin,Meaning,andDefinitionofValue,TypesofValues,IndividualValue,FamilyValue, SocietalValue,HumanValue,ValueinEducationSystem,UnderstandingHappinessand Prosperity,Self-ExplorationandNaturalAcceptance.	6
UNIT-II	
Harmony in family, Harmony in Society, Values Leading to Harmony, Creating a world family,HarmonyinNature,EnvironmentandSustainableDevelopmental,LegalaspectsofEnvironment, HolisticPerspectivesofValues,ExistenceandCo-existence.	6
UNIT-III	
Origin,MeaningandDefinitionofEthics,Ethics:ThescienceoftheMoralityofTheArtofCorrect Living,EthicsinHumanActs,EthicsandReligion,EthicalNormsandLaws,EthicsinLiterature, EthicsinScienceand Technology.	6
UNIT-IV	
EthicalApproaches:TheisticApproach,AtheisticApproach,GeneralandSpecialEthics, ProfessionalEthics:Ethicsatwork-place,EthicsasSkill,ValuesandEthics,EthicswithValue Education, Managerial and Business & Corporate Ethics, Corporate Social Responsibilities.	6

Text Books&References

1. Bangaria, G. P et.al, (2010) A foundation course in Human Values and Professional Ethics, Excel books.
2. Govindrajan,M.(2013)ProfessionalEthicsandHumanValues,EasternEconomyEdition.
3. Naagrazan,R.S.(2018)TextbookonProfessionalEthicsandHumanValues,Newage International. Misra, Anuranjanand Shukla, Dr. R.K., Human values and Professional Ethics.
4. Fernando,A.C.,(2009)BusinessEthics:AnIndianPerspective,Pearson,India.

Course Code:	Physics of IOT Sensors and Actuators

BSM-227		
Course category	:	BSM
Pre-requisite Subject	:	**NIL**
Contact hours/week	:	Lecture:2, Tutorial:0, Practical: 0
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor test and one major theory examination.
Course Objectives	:	Understand the fundamental physical principles governing the operation of sensors and actuators.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Analyze the behavior of various sensor types, including their sensing mechanisms and limitations.
2. Design and implement signal conditioning circuits for interfacing sensors with microcontrollers or IoT devices.
3. Evaluate different communication protocols and methods used for transmitting sensor data in IoT systems.
4. Analyze the characteristics and functionalities of actuators commonly used in IoT applications.
5. Design and implement basic control algorithms for actuator systems in IoT environments.
6. Integrate sensors and actuators into IoT systems for specific applications.

Topics Covered

UNIT-I	**6**
Introduction to IoT and Sensor Networks, Overview of IoT architecture and applications, Characteristics and challenges of IoT sensor network, Fundamentals of Sensors, Sensor classification and characteristics, Sensing principles: resistive, capacitive, inductive, optical, etc.	
UNIT-II	**6**
Sensor calibration and error analysis, Signal Conditioning and Processing, Analog signal conditioning techniques, ADC (Analog-to-Digital Conversion) basics, Digital signal	

processing for sensor data.Communication in IoT Systems, Wired and wireless communication protocols (e.g., Bluetooth, Wi-Fi, Zigbee)	
UNIT-III	**6**
IoT communication architectures (client-server, peer-to-peer), Data transmission and security considerations, Actuators in IoT, Types of actuators: motors, solenoids, relays, etc., Principles of operation and characteristics.	
UNIT-IV	**6**
Control mechanisms for actuators, Integration of Sensors and Actuators, Sensor and actuator interfacing with microcontrollers and IoT devices, IoT system design considerations, Case studies and applications.	

Text and Reference Book

Textbook:

"Principles of IoT Sensors and Actuators"

References:

1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things" by David Hanes and Gonzalo Salgueiro
2. "Sensors and Actuators: Engineering System Instrumentation" by Clarence W. de Silva
3. "Internet of Things (IoT): A Hands-On Approach" by Arshdeep Bahga and Vijay Madisetti
4. Note: The specific textbooks and references may vary based on instructor preference and course focus.

Course Code: BEC-201		**Digital Electronics and Computer Organization**
Course category	:	Engineering Fundamental (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, two minor tests and one major theory & practical examination.

Course Objectives	:	The course is aimed to develop the concepts of digital electronic and computer organization skills of engineering students that are imperative for effective understanding of engineering subjects.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Acquired knowledge about basics of digital electronics and solving problems related to number systems and Boolean algebra.
2. Ability to identify, analyze and design combinational and sequential circuits.
3. To design, implement and evaluate various synchronous and asynchronous sequential circuits and applications.
4. Acquired knowledge about internal circuitry and logic behind any digital system.
5. Ability to understand basic building blocks of a computer system and addressing techniques in computer organization.
6. Acquired knowledge about Indian Super Computer 'PARAM'.

Topics Covered	
UNIT-I	
Overview of Digital Electronics: Number Systems, Boolean algebra: Representation of values and complements, De'Morgans theorem-simplifying expressions. AND, OR, NOT, XOR, XNOR, NAND, NOR gates and their truth tables, Combinational logic circuits for expressions using NAND and NOR gates, Logic circuit families and characteristics, SSI, MSI, LSI and VLSI circuits	**9**
UNIT-II	
Combinational and sequential circuits: (Simple block diagrams, truth tables and IC packages only required). Adders, decoders, multiplexers, encoder circuits, Flip-flops: RS, clocked RS, JK, D and T flip flops, Master slave flip flops, edge and level triggering, Multivibrators - Astable, Bistable, Monostable, counters-ripple and decade. Registers, latches and Tristate buffers.	**9**
UNIT-III	
Building blocks of a computer system: Basic building blocks-I/O, memory, ALU, Control and their interconnections, Control unit and its functions- Instruction-word, Instruction execution cycle, organizational sequence of operation of control registers; controlling of arithmetic operations; branch, skip, jump and shift instructions, ALU-its components. **Addressing techniques and registers:** Addressing techniques-Direct, immediate addressing; paging, relative, Indirect and indexed addressing. Memory buffer register; accumulators; Registers-Indexed, General purpose, Special purpose; overflow, carry, shift, scratch registers; stack pointers; floating point; status information and buffer registers	**9**
UNIT-IV	
Memory: Main, RAM, static and Dynamic, ROM, EPROM, EAROM, EEPROM, Cache and Virtual memory. Interconnecting System components: Buses, Interfacing buses, Bus formats-address, data and control, Interfacing keyboard, display, auxiliary storage devices, and printers. I/O cards in personal computers. Development of Indian Super Computer 'PARAM': History, Characteristics, Strengths, Weakness and basic Architecture.	**9**

LIST OF EXPERIMENTS

1. Design and verification of following arithmetic circuits using 74xx family ICs.
   a. Half adder and Full adder
   b. Half subtractor and full subtractor
2. To perform the code conversion- binary to gray and gray to binary and its truth table verification.
3. To design a combinational logic circuit using 74xx family ICs and its truth table verification in both SOP and POS forms.
4. Realization of 2:4 decoders and 4:2 encoder circuit and verification of its truth table.
5. To design and verify the truth table of multiplexer and demultiplexer circuits.
6. To design a 1-bit comparator using 74xx family ICs and to study the performance of 4-bit comparator IC 7485.

Text and Reference Books

1. Digital principle and applications Malvino and Leach- (TMH)
2. A.S.Tannenbaum : Structured Computer Organization, Pearson
3. Thomas C. Bartee : Digital Computer Fundamentals, McGraw-Hill
4. Duglus V Hall : Microprocessors and Interfacing: programming and Hardware, McGraw-Hill, 1986

Course Code: BHM-201		**SCIENTIFIC AND TECHNICAL WRITING**
Course category	:	HSS
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial : 0 , Practical: 0
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, two Minor Testsand one Major Theory Examination.
Course Objectives	:	To Prepare Professionals with a view to developing the power of know-how of the subject and enhance them face challenges in English language.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Overcome the problems he/she faces in oral and written communication.
2. Acquire knowledge of and methods for using technical communication, such as, reports, proposals and business letters etc.
3. Use and practice compositions correctly.
4. Enhancing word power by counselling scientific literature.
5. Focusing on effortless speaking and writing.
6. Give Presentations in different sessions and make self-appraisal

Topics Covered

UNIT-I	
Language Vs communication: Communication as coding and decoding – signs, symbols & pictograph – verbal and non –verbal symbols – Language & communication; Types of Communication- functional, situational, verbal, and non-verbal, interpersonal, group, interactive, public, Mass Communication.Thinking and Articulation – cognitive, affect, critical, creative aspects of articulation. **Skills of Language Acquisition:** Natural Language Acquisition Skills: Listening, Speaking, Reading & Writing {LSRW}; Language Acquisition Through Training: Listening, Speaking, Reading, Writing, Grammar & Vocabulary {LSRWGV} **Phrase, Clause & Sentence:Professional Drafting**-Simplicity, Clarity and Conciseness of a Presentation, Differentiating between Professional & Creative Writing, Blending of Artistic/Professional Writing, Avoiding gender, racial and other forms of bias in Professional Writing. Pre Writing, Drafting and Re-writing. **Processing Professional Data:** Data Collection, Literature Review, Data Analysis, Drafting Data & Deriving Inferences.	**6**
UNIT-II	
Technical Paper Writing: Professional Paper Elements-Front Matter of a Paper, Main Text of a Paper, End Matter of a Paper: Organising References and Bibliography, Order of a thesis and Paper Elements, Concluding Remarks. **Methods of Research Paper Writing:** Identification of Author and His Writing-Author's name and Affiliation, Joint Authorship of a Paper, Identification of Writing-Title, Keywords, Synopsis, Preface and abstract. Drafting Research Article & Methodology. **Thesis/Dissertation Writing:** Thesis Elements-Front Matter of a Thesis, Main Text of a Thesis, End Matter of a Thesis, Specimen—Thesis and Research Paper, Chapters and Sections-Introductory Chapters and Sections, Statement of the Problems, Plan and Scope, Core Chapters and Sections-Theoretical Analysis and Synthesis, Basic Assumption and Hypothesis. **Professional Presentation & Seminar Delivery Tools**: Designing the Presentation; Establishing the Objectives. Making Professional Power Point Presentations, Signalling Structure of Presentation through Sentences and Crisp Phrases, Preparing Notes for Professional/Technical Presentation, Text Animation, White Board, Flip Charts, Diagrams, Preparing Cards. Seminar Presentations: Purpose modes and methods. Nascent Emerging Platforms for On-line Presentations viz. Zoom, Webex, Team & Meet etc.	**6**
UNIT-III	

Introduction to Generation–Z, Cyber Identity & Professional Netiquettes for Netizens: Drafting E-mails, Blogs on social media, Videoconferencing. Managing Profiles on social media. What to Write and Share on social media. **Professional Drafting:** Letters Vs E-mails, Formal and Informal mails, Parts of e-mails, Types of e-mails, Managing tone of E-mails & Business Letters, Examples of Letters & E-mail, Professional Correspondence through E-mail, Job Applications & Covering Letters. Introduction to DOs (Demi-Official Letters) **Conducting Professional Meeting:** Pre-meeting Preparation, During Meeting: Action Taken Report (ATR) & New Agenda Points, Post Meeting Follow ups. Notice, Circular, Agenda & Minutes. **Career & Correspondence:** Developing a Professional C.V, Bio Data & Resume Building. Report Writing, Kinds of Reports, Length of Report, Parts of a Report, Terms of Reference, Collection of Facts, Outlines of Report, Examples of Report, Technical Proposal, Elements of Proposal, Examples of Proposal, drafting of proposal.	**6**
UNIT-IV	
Professional Interviews- Interview skills-body language, gesture, posture, tips, and tactics of interview. Professional interview of an expert. Questioning & Answering Skills. **Case study**- objectives, methods, examples of various case-study. **Audience Analysis in Technical Writing**: Industrial vs. non-industrial users; Exploring primary, secondary, tertiary users in contexts of production and use; Creating personas; Multicultural issues; Analysing real-world examples. Estimating, tracking, and managing tech writing projects. Determine the project scope, Estimates and schedules, Assemble the team, provide resources and leadership, Evaluate the project, Appendixes and Annexure, References, Peripherals—Official Formalities, Rights and Permission, Certificate and Copyright, Dedication, Acknowledgement, Correspondences. Managing Tone in Writing. **Project Writing:** Elements of a Professional Project Making: Making a final Project on topics, given by the instructor, Result & Discussion.	**6**
Text and Reference Books	
1. Acharya Anita. (2012) *Interview Skills- Tips & Techniques*. Yking Books, Jaipur. 2. Basu, B. N., (2008) *Technical Writing*. PHI Learning Pvt. Ltd.., New Delhi. 3. Chauhan, N. K & Singh, S. N. (2013) *Formal Letters*, Pankaj Publication International, New Delhi. 4. Chhabra T.N. (2018) *Business Communication. Sun* India Publication New Delhi. 5. Dubey Arjun et.al. (2016) *Communication for Professionals. Alfa* Publications, Delhi.	

Course Code: **BIT-281**	**Introduction to Java Programming**	
Course category	:	PC

Pre-requisite Subject	:	**NIL**
Contact hours/week	:	Lecture:3, Tutorial:0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor test and one major theory examination.
Course Objective	:	The course covers the programming and demonstrates fundamental programming techniques, customs and terms including the most common library functions and the usage of the pre-processor. 1. To develop Programs in Java using basic programming constructs. 2. To develop programs in Java using arrays and strings. 3. To develop applications in Java functions, structures and pointers.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. To improve your problem-solving skills.
2. To understand the concept of Object-Oriented Programming
3. To analyze and explain the behavior of programs involving the fundamental program constructs
4. To identify and correct syntax and logic errors in short programs
5. To design and implement a class based on attributes and behaviors of objects
6. To describe the parameter passing mechanisms in terms of formal parameters, actual parameters, non-object parameters and object parametersand master OOP using C++.

Topics Covered

UNIT-I	**9**
Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism. - Objects and classes in Java – defining classes – methods - access specifiers – static members – constructors – finalize method Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes	
UNIT-II	**9**
The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes. Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT	

event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.	
UNIT-III	**9**
Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.	
UNIT-IV	**9**
Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics - Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors – synchronizers. JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database.	
List of Experiments	
1. Basic programs of simple statements, conditional statements, iterative statements and arrays 2. Programs having object-oriented concepts like Inheritance and Interface 3. Programs for Exception Handling and Event Handling 4. Programs of Threads and Multithreading 5. Programs related to Applets and Swings 6. Programs including JAVA Beans and Servlets	
Text and Reference Book	
1. Naughton, Schildt, The Complete Reference JAVA2, TMH. 2. Balaguruswamy E, Programming in JAVA, TMH 3. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth Edition, Sun Microsystems Press 4. K. Arnold and J. Gosling, “The JAVA programming language”, Third edition, Pearson Education, 2000.	
Reference Book	
1. Margaret Levine Young, The Complete Reference Internet, TMH. 2. Dustin R. Callway, Inside Servlets, Addison Wesley. 3. Mark Wutica, JAVA Enterprise Edition, QUE. 4. Steven Holzner, JAVA2 Black book, Dreamtech. 5. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition,	

Pearson Education, 2000.
6. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.

Course Code: BEC-203		**Electronic Measurement & Instrumentation**
Course category	:	Program Core (PC)
Pre-requisite Subject	:	Nil
Contact hours/week	:	Lecture: 2, Tutorial:1, Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, assignments, quizzes, two minor tests and one major theory examination.
Course outcomes	:	The course is aimed to develop the concepts of electronic measurement & instrumentation skills of engineering students.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.
1. Able to explain the quality measurements with electronic instruments. 2. Able to articulate the range of measuring instruments. 3. Able to solve and illustrate the numerical problem for DC/AC bridge-based circuits. 4. Able to illustrate the principles of various types of transducers and their applications. 5. Able to explain the construction, principle of operation, and applications of Data Acquisition System (DAS). 6. Able to use the digital display devices in practical applications.		

UNIT-I	6
Measuring Instruments: classification, absolute and secondary instruments, Performance Characteristics, Error in measurement, Sources of error, Arithmetic mean, Deviation from the mean, Average deviation, Standard deviation, Limiting errors. Ammeters and Voltmeters, PMMC, Moving Iron (MI) type, Expression for the deflecting torque and control torque, Extension of range using shunts and series resistance.	
UNIT-II	6
DC/AC Bridges: General equations for bridge balance, Self-inductance measurement by Maxwell's bridge, Hay's bridge, Capacitance measurement by Schering bridge, Method of measuring low, medium and high resistance: Kelvin's double bridge for measuring low	

resistance, Wheat-stone's bridge, measurement of high resistance, Basics of wattmeter and energy meter	
UNIT-III	6
Transducers: Introduction, Selection Parameters of Transducer, Type of Transducer, Resistive Transducer, Strain Gauges, Inductive Transducer: LVDT, Capacitive Transducer, Photo-electric Transducer, Photo-Voltaic Cell, Photo Transistors, Temperature Transducers, Digital Transducer.	
UNIT-IV	6
Data Acquisition and Conversion: Introduction, Objective of Data Acquisition System, Single and Multichannel DAS, A/D and D/A converters using Op-Amp, Data Loggers: Block diagram, principle of operation Digital Display Devices: LED, LCD, Incandescent Display, LVD (Liquid Vapour Display)	

Text and Reference Books

1. H. S. Kalsi, "Electronic Instrumentation", 3rd Ed., McGraw Hill Education(India), 2015.
2. David A. Bell, "Electronic Instrumentation and Measurements", 3rd Ed., Oxford University Press, 2013.
3. A K Sawhney, "Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai & Co.

Course Code: BEC-204		**ELECTRONIC DEVICES & CIRCUITS**
Course category	:	Department Core (PC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 2, Tutorial : 1, Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, and two minor tests and one major theory examination.
Course Outcomes	:	The course is aimed to develop the concepts of electronic devices & circuits skills of engineering students that are imperative for effective understanding of engineering subjects.

Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Ability to understand the basic operation and working of BJT.
2. Able to understand the small-signal operation and models of BJT.
3. To understand and use of the device models to explain and calculate the characteristics of the field effect transistors.
4. Able to understand the small-signal operation and models of MOSFET.
5. To be able to understand and analyze the feedback amplifiers.
6. Understand the basic principles of oscillators.

Topics Covered

UNIT-I	6
BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit; Small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier. Darlington pair, BJT differential pair, Cascode and Cascade amplifier.	
UNIT-II	6
MOSFET: Review of device structure operation and V-I characteristics, MOSFET Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits; Small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier.	
UNIT-III	6
Feedback Amplifiers: The general feedback structure, properties of negative feed- back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt-series feedback amplifier.	
UNIT-IV	6
Oscillators: Basic principles of sinusoidal oscillators, RC Phase-shift Oscillator circuits, Resonant-circuit based LC oscillators.	

Text and Reference Books

1. Milman, Halkias&Jit- Electronics Devices and Circuits- TMH
2. Donald ANeaman, “Semiconductor Physics and Devices Basic Principles”, 3e, TMH India.

Course Code: BCS-205	**DATA STRUCTURE & ALGORITHMS**	
Course category	:	PLBSE
Pre-requisite Subject	:	NIL

Contact hours/week	:	Lecture: 2, Tutorial: 0, Practical: 2
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, assignments, quizzes, practical work, record, viva voce, two minor tests and one major theory & practical examination.
Course Objectives	:	This course helps the students in gaining the knowledge of data structure concepts, arrays, stack, queues, trees etc, discussion of various implementations of these data objects, programming styles, and run-time representations. Course also examines algorithms for sorting and searching. Algorithm analysis and efficient code design is discussed.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Explain how to use a specific data structure in modelling a given problem
2. Identify, construct, and clearly define a data structure that is useful for modelling a given problem.
3. Use a specific algorithmic technique in solving a given problem.
4. Design an algorithm to solve a given problem.
5. Define the notions of worst-, best-, and average-case running times of algorithms.
6. Combine fundamental data structures and algorithmic techniques in building a complete algorithmic solution to a given problem.

Topics Covered

UNIT-I	**9**
Introduction to Algorithms and Algorithm Strategies: Overview, Algorithm Strategies, Overview of Specific Algorithms, Introduction to Run Time Analysis and Big-O: Overview, Asymptotic Run Time Complexity, Big O Notation, Analysis of Algorithms, Implementation of Specific Algorithms, Algorithm Specifications: Performance Analysis and Measurement (Time and space analysis of algorithms-Average, best & worst case analysis).	
UNIT-II	9
Introduction to Essential Data Structures: Overview, Fundamental Data Structures, Visualizing Data Structures, Types of Data Structures-Linear & Non-Linear Data Structures. **Linear Data Structure:** Array: Representation of arrays, Applications of arrays, sparse matrix and its representation, Stack: Definitions & Concepts, Operations on Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression and Their Compilation, Recursion, Tower of Hanoi.	
UNIT-III	9
Queue: Representation of Queue, Operations on Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue, Linked List: Singly Linked List, Doubly Linked list, Circular linked list, Linked implementation of Stack, Linked implementation of Queue **Nonlinear Data Structure**: Tree-Definitions and Concepts, Representation of binary, tree, Binary tree traversal (Inorder, Postorder, Preorder), Threaded binary tree, Binary search trees, AVL trees.	

UNIT-IV	9
Graph-Matrix Representation of Graphs, Elementary, Graph operations, (Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree). **SORTING And SEARCHING:** Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Linear Search, Binary Search.	

EXPERIMENTS:

1. **Stack operations-**Write a program to perform PUSH, POP, PEEP & CHANGE operations on Stack.
2. **Queue Operations-**Write a program to implement insertion & deletion in a queue.
3. **Circular Queue Operations-**Write a program to implement insertion & deletion in a circular queue
4. Write a program for linked list insertion, deletion & copy
5. **Sorting and searching:** Write a program to perform
    a. Selection sort
    b. To sort the given number using bubble sort
    c. Merge sort
    d. Quick sort
    e. Sequential and binary search

Text and Reference Books

1. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, Publisher-Tata McGraw Hill.
2. Ten Baum, Data Structures using C &C++ , Publisher – Prenctice-Hall International.
3. Horowitz, Sahni, Fundamentals of Computer Algorithms, Galgotia Pub. 2001 ed.
4. Sartaj Sahani, Fundamentals of Data Structures in C++.
5. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, Publisher-Thomson Learning.

Course Code: **BSM-276**	**Principles of Electromagnetism and Antenna Systems**	
Course category	:	BSM
Pre-requisite Subject	:	**NIL**
Contact hours/week	:	Lecture:3, Tutorial:1, Practical: 0
Number of Credits	:	4

Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor test and one major theory examination.
Course Objectives	:	This course provides an in-depth study of electromagnetism principles and their application to antenna systems. Topics include Maxwell's equations, electromagnetic waves, transmission lines, antenna fundamentals, radiation patterns, and antenna design techniques.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Fundamental understanding of electric circuits
2. Understand the fundamental principles of electromagnetism.
3. Analyze electromagnetic fields and waves using Maxwell's equations.
4. Gain knowledge of transmission lines and their characteristics.
5. Learn the principles of antenna design and analysis.
6. Develop skills in designing and optimizing antenna systems.

Topics Covered

UNIT-I	**9**
Introduction to Electromagnetism: Overview of electromagnetism, Coulomb's law and electric fields, Gauss's law and electric flux, Magnetic fields and Biot-Savart law, Ampere's law, **Maxwell's Equations**: Formulation of Maxwell's equation, Differential form and integral form, Boundary conditions, Time-varying fields and electromagnetic waves.	
UNIT-II	**9**
Electromagnetic Waves: Wave equation**,** Plane waves**,** Polarization**,** Energy and power in electromagnetic waves **Transmission Lines:** Transmission line equations**,** Reflection and transmission coefficients**,** Smith chart**,** Impedance matching techniques	
UNIT-III	**9**
Antenna Fundamentals: Introduction to antennas**,** Antenna parameters: gain, directivity,	

efficiency**,** Radiation mechanisms**,** Antenna types and classifications **Radiation Patterns:** Far-field approximation**,** Radiation pattern characteristics**,** Beamwidth, directivity, gain**,** Antenna arrays	
UNIT-IV	**9**
Antenna Analysis: Antenna impedance**,** Input impedance matching**,** Antenna measurements and testing**.** **Antenna Design Techniques:** Wire antennas: dipole, monopole**,** Aperture antennas: microstrip, horn, reflector**,** Arrays and array synthesis**,** Numerical methods in antenna design,Antenna modeling and simulation software, Microwave antennas, Recent advancements in antenna technology	
Text and Reference Book	
1. "Antenna Theory: Analysis and Design" by Constantine A. Balanis, Wiley 2. "Antenna Theory and Design" by Warren L. Stutzman and Gary A. Thiele Publisher: Wiley	

Course Code: **BEC-257**	**Computer Networks**	
Course category	:	PC
Pre-requisite Subject	:	**NIL**
Contact hours/week	:	Lecture:3, Tutorial:1, Practical: 0
Number of Credits	:	4

Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor test and one major theory examination.
Course Objective	:	The objective of the course is to equip the students with a general overview of thefundamental concepts of computer networks, understand basic network models and Different transmission used for datacommunication.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Able to explain the principles of routing and the semantics and syntax of IP.
5. Develop application layer protocols.
6. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation

Topics Covered

UNIT-I	**9**
Introduction to networks, internet, protocols and standards, the OSI model, layers in OSI model, TCP/IP suite, Addressing, Analog and digital signals. Physical Layer: digital transmission, multiplexing, transmission media, circuit switched networks, Datagram networks, virtual circuit networks, switch and Telephone network.	
UNIT-II	**9**
Data link layer: Introduction, Block coding, cyclic codes, checksum, framing, flow and error control, Noiseless channels, noisy channels, HDLC, point to point protocols. Medium Access sub layer: Random access, controlled access, channelization, IEEE standards, Ethernet, Fast Ethernet, Giga-Bit Ethernet, wireless LANs.	
UNIT-III	**9**

Connecting LANs, backbone networks and virtual LANs, Wireless WANs, SONET, frame relay and ATM. Network Layer: Logical addressing, internetworking, tunneling, address mapping, ICMP, IGMP, forwarding, uni-cast routing protocols, multicast routing protocols.	
UNIT-IV	**9**
Transport Layer: Process to process delivery, UDP and TCP protocols, SCTP, data traffic, congestion, congestion control, QoS, integrated services, differentiated services, QoS in switched networks. Application Layer – Domain name space, DNS in internet, electronic mail, FTP, WWW, HTTP, SNMP, multi-media, network security	
Text and Reference Book	
1. Data Communications and Networking – Behrouz A. Forouzan, Fourth Edition TMH,2006. 2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education. 3. Computer and Communication Networks,Nader F. Mir, Pearson Education 4. Computer Networking:A Top-Down Approach Featuring the Internet,James F.Kurose,K.W.Ross,3rd Edition,Pearson Education.	

Course Code: **BEC-252**		**Principles of Communication Systems**
Course category	:	PC
Pre-requisite Subject	:	**NIL**
Contact hours/week	:	Lecture:3, Tutorial:1, Practical: 0

Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, assignments, quizzes, record, viva voce, two minor tests and one major theory examination.
Course Objective	:	This course is intended to develop the concepts of signals, frequency domain transformation, communication systems with analog modulation schemes.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Able to understand the characteristics of different signals and operation on signals.
2. Acquire the knowledge of Fourier Series, Fourier Transform, Laplace Transform and their properties.
3. Able to analyze the behavior of continuous and discrete time system in time & frequency domain.
4. Able to understand the amplitude modulation.
5. Able to understand the angle modulation.
6. Able to understand the multiple access techniques.

Topics Covered

UNIT-I	**9**
Signals: Introduction to elementary signals, Representation of Composite signals using elementary signals, Classification of signals, Operation on signals, Time shifting, Time scaling, Time Reversal, Fourier series and its properties, Magnitude & Phase spectrum of Fourier coefficient, Fourier transform for continuous time signals (CTFT), Fourier transform of Discrete time signals (DTFT), Inverse Fourier Transform CT & DT Signals, Properties of CTFT & DTFT	
UNIT-II	**9**
Laplace Transform and properties, Inverse Laplace Transform, Z-transform and properties, Inverse Z-transform, Sampling theorem and applications,	

Systems: Introduction to Continuous and Discrete time LTI systems, Properties of LTI Continuous and discrete time systems, Response of Continuous and discrete time LTI system, Time domain analysis and Frequency domain analysis of Continuous & Discrete time LTI System. Block diagram representation of continuous and discrete time system	
UNIT-III	**9**
Introduction of Communication system: Elements of Communication systems, Need of modulation and Modulation techniques, Baseband and Pass band signals, Introduction of analog and digital modulation. **Detailed Analysis of Amplitude Modulation (AM) and demodulation:** Modulation index, Types of amplitude modulation, Double sideband with Carrier (DSB-C), Double side band without Carrier (DSB-SC), Single Side Band Modulation (SSB), vestigial Modulation (VSB), Power Spectrum and Bandwidth of different modulation scheme	
UNIT-IV	**9**
Detailed Analysis of Angle modulation: Types of angle modulation, Frequency Modulation (FM): Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, Phase modulation (PM): Transmission bandwidth of PM Signals, Generation of PM Signals, Demodulation of PM Signals, Carson's Bandwidth, Comparison of FM and PM system. superheterodyne receivers, Basics of TDMA, FDMA and CDMA.	
Text and Reference Book	
1. Alan V Oppenheim and S Hamid, "Signals and Systems", Pearson New International Edition 2. Barry Van Veen and Simon Haykin "Signals and Systems", 2e, Wiley India 3. H. Taub, D L Schilling and GoutomSaha, "Principles of Communication", 3e, Tata McGraw-Hill Publishing Company Ltd. 4. Simon Haykin, "Communication Systems",4e, Wiley India. 5. H. P. HSU and D. Mitra, "Analog and Digital Communications", 2e, Tata McGraw-Hill Publishing Company Ltd.	

Course Code: **BEC-258**	**Introduction to Raspberry Pi Programming**	
Course category	:	PC
Pre-requisite Subject	:	**NIL**
Contact hours/week	:	Lecture:3, Tutorial:0, Practical: 4
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, assignments, quizzes, two minor test and major theory examination.
Course Objective	:	This course elucidates concepts related to Internet of Things. The students will get hands-on experience in working with Raspberry Pi 3 and exploring IoT.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi.
2. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia
3. Able to use more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice, while also exposing the student to other comparable platforms.
4. Able to understand the working of Raspberry Pi, its features and how various components can be used with Pi.
5. After doing this course, students should be able to design and deploy multiple IoT devices that could connect to the gateway.
6. Analyze applications of IoT in real time scenario

Topics Covered

UNIT-I	**9**
Getting Started with Raspberry Pi: Raspberry Pi: Raspberry Pi board and its processor, Programming the Raspberry Pi using Python, Communication facilities on Raspberry Pi	

(I2C,SPI, UART), Interfacing of sensors and actuators. Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behavior of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS.	
UNIT-II	**9**
Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface, Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.	
UNIT-III	**9**
Communication with devices through the pins of the Raspberry Pi, RPi. GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface	
UNIT-IV	**9**
IoT Design using Raspberry Pi, IoT Applications based on Pi, LAMP Web-server, GPIO Control over Web Browser, Creating Custom Web Page for LAMP, communicating data using on-board module, Home automation using Pi, Node-RED, MQTT Protocol, Using Node-RED Visual Editor on Rpi.	
List of Experiments	
1. To assemble Raspberry Pi hardware components and Boot up Raspberry Pi and access the command line interface. 2. To Write a simple Python script to blink an LED connected to GPIO pins. 3. To Write a Python script to read temperature and humidity data from the sensor by connect a DHT11 or DHT22 sensor to Raspberry Pi. 4. To write a Python script to detect button presses and trigger an action (e.g., LED blinking). 5. To write a Python script to detect motion using the Passive Infrared (PIR) motion sensor	

to Raspberry Pi.

6. To Write a Python script to control the servo motor's position to Raspberry Pi and data seen on serial monitor.
7. To write a Python script to measure distance using the an ultrasonic distance sensor (e.g., HC-SR04) to Raspberry Pi.
8. To Create a simple web server that displays sensor data (e.g., temperature and humidity) on a web page.
9. To write a Python script to capture images or record videos using the camera.

Text and Reference Book

1. Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", January 2012, McGraw Hill Professional
2. Massimo Banzi, "Getting Started with Arduino", First Edition, February 2009, O'Reilly Media, Inc
3. Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, John Wiley & Sons
4. Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, John Wiley &Sons .
5. Michael Margolis, "Arduino Cookbook", First Edition, March 2011, O'Reilly Media, Inc.

Course Code: **BCS-258**	**Python for IOT**	
Course category	:	PC
Pre-requisite Subject	:	**NIL**
Contact hours/week	:	Lecture:3, Tutorial:1, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor test and one major theory

		examination.
Course Objective	:	1. Develop proficiency in Python programming language 2. Learn how to interact with IoT devices using Python 3. Gain hands-on experience in building IoT applications
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Gain a comprehensive understanding of the Internet of Things (IoT) ecosystem, its components, and its applications across various domains.
2. Develop a strong foundation in Python programming language, including syntax, control structures, data types, and data structures.
3. Acquire the skills to interface with sensors and actuators using Python, enabling communication and data exchange with IoT devices.
4. Learn how to implement IoT protocols such as MQTT for efficient communication between IoT devices and systems.
5. Understand techniques for collecting, processing, and analyzing sensor data using Python, including storing and retrieving data from databases.
6. Develop the ability to control actuators and implement automation logic using Python scripts, facilitating responsive and intelligent IoT applications.
7. Gain hands-on experience in designing and developing IoT applications using Python, integrating sensor data with web applications and building end-to-end IoT systems.
8. Understand the security challenges inherent in IoT systems and learn best practices for implementing security measures to protect IoT devices and data.

Topics Covered

UNIT-I	**9**
Introduction to IoT: Understanding IoT ecosystem**,** Applications of IoT**,** IoT architecture and components**. Introduction to Python:** Basics of Python programming language**,** Control structures (if, else, loops)**,** Data types and data structures	
UNIT-II	**9**

Working with Sensors and Actuators: Introduction to sensors and actuators**,** Interfacing sensors and actuators with microcontrollers**,** Communicating with sensors and actuators using Python**. IoT Protocols:** Overview of IoT protocols (MQTT, CoAP, HTTP)**,** Hands-on experience with MQTT protocol for IoT communication	
UNIT-III	**9**
Data Acquisition and Processing: Collecting sensor data using Python**,** Processing sensor data for insights**,** Storing and retrieving data from databases**. IoT Device Control:** Controlling actuators using Python**,** Implementing automation and control logic	
UNIT-IV	**9**
IoT Application Development: Designing IoT applications**,** Integrating sensor data with web applications**,** Building a complete IoT system**. Security in IoT:** Understanding IoT security challenges**,** Implementing security measures in IoT applications**,** Best practices for secure IoT development	
Text and Reference Book	
1. Python Crash Course" by Eric Matthes 2. Getting Started with Raspberry Pi" by Matt Richardson and Shawn Wallace	

Course Code: BEC-255		**Electronic Software Tools**
Course category	:	Programming Language based Skill (PLBSE)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture :1, Tutorial : 0 , Practical: 2
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through tutorials, attendance, assignments, quizzes, practical work, record, viva voce, two minor tests and one major theory & practical examination.
Course Objectives	:	This course is intended to develop the skills on electronic software tools using Multisim and SPICE tools like Cadence, Mentor etc.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.
1. Able to familiarized with Multisim 2. Use Multisim to capture circuit schematics 3. Able to perform simulation and implementation of electronic circuits		

4. Use interactive simulation to check circuit design
5. Perform circuit Analysis using SPICE
6. Able to transfer PSICE design to PCB layout

Topics Covered

UNIT-I	
Introduction to MultiSim, Design procedures, Setting MultiSim simulation environment: Capture of schematics.	3
UNIT-II	
Simulation and result display, Implementation of simple electronic circuits	3
UNIT-III	
Work with design variants, Configuring application circuits, Analysis of circuits using MultiSim	3
UNIT-IV	
design of Analog and Digital circuits, SPICE modelling and circuit analysis,Perform measurements and test on circuits, Comparison of simulated results with measured results of real circuit, Design transfer to PCB layout	3

List of Experiments: (8 practicals out of 13 will be conducted)

1) Design and simulation of RC based filter circuits.
2) Design and simulation of oscillator circuit.
3) Design and simulation of inverter circuit.
4) Simulation of diodes based circuit using SPICE simulator software
5) Simulation of transistors based circuit using SPICE simulator software
6) Circuit design and simulation using Cadence.
7) Circuit design and simulation using Mentor Graphics.
8) Introduction to VHDL and Verilog.
9) To layout the basic prototype of elevator in proteus simulation software program using Atmega16 microcontroller.
10) Developing domestic Home Automation Circuit using Atmega328p in proteus simulation software to enforce UART protocol.
11) Using Soil Moisture and DHT sensor build a IoT based irrigation system using Atmega328p as microcontroller in proteus simulation software (both schematic and PCB layout).
12) Simulation of smart street light in on proteus professional software.
13) Development of Humidity Sensor Unit using ATMega16 and Simulate on Proteus professional software.

Text and Reference Books
1. ElectronicDevicesandCircuits-BoylestadandNashelsky, 6e, PHI, 2001 2. Neamen, Donald A. *Microelectronics: circuit analysis and design*. Vol. 43. New York: McGraw-Hill, 2007. 3. Salivahanan, S. *Electronic devices and circuits*. 5th edition, Oxford publication