SEMESTER-II

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Name of The Course	Embedded System & IOT	L	T	P	C
Course Code	BEE01T1004	1	0	2	2
Version No					
Prerequisite	**Basic programming Languages**				
Co requisite					
Anti- requisite					

Course Objectives

1. To provide the awareness of major embedded devices and interfacing devices
2. To understand key technologies in Internet of Things.
3. To analyze, design or develop parts of an Internet of Things solution for IoT applications.

Course Outcomes

Upon successful completion of this course, students will be able to

CO1	Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
CO2	Recognize and analyze given embedded system design and its performance.
CO3	Identify the programming environment to develop embedded solutions.
CO4	Demonstrate application-based competencies in Embedded Programming
CO5	Identify and adopt knowledge of the terminology, requirements and constraints for IoT system development.
CO6	Demonstrate IoT system for smaller applications

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Course Content

UNIT I INTODUCTION TO EMBEDDED SYSTEM
Basic components of Embedded system, Programming Language Classification of Embedded system, Advantage & Disadvantage, Difference between Microprocessor & Microcontroller, Classification based on architecture, Memory Classification, Description of RAM, Description of CPU Registers, Introduction to Embedded C, Difference between C & Embedded C.
UNIT II CONTROL STATEMENTS AND FUNCTIONS
Decision making with if statement, If….else statement, Switch statement, GOTO statement, The While and Do – While statements, For statement, Why Functions, Types of Functions, Multi-functional program, Return values & their types
UNIT III EMBEDDED SOFTWARE AND HARDWARE INTERFACING
Kiel Compiler, Proteus, Interfacing of LED, Seven segment display, , LCD, Switches, Keyboard, Serial Communication, Sensors.
UNIT IV INTRODUCTION TO IoT
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates
List of Experiments (At least SIX experiments needs to be performed) • Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:- character send and received, Read and display voltage • Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer • Hands on experiments on Interfacing of the LDR, LCD: Experiment on LCD display:-Print numbers, Name, Time etc. • Experiments using Seven Segment display. • Experiments using Temperature, IR, Finger print sensors. • Experiments with Raspberry Pi using LED. • Experiments on the applications of Buzzer, potentiometer. • Experiments on Interfacing with Bluetooth devices. • Design and development of Arduino/Raspberry Pi based system for defined application/ projects. • Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:- character send and received, Read and display voltage . • Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer. • Hands on experiments on Interfacing of the LDR, LCD: Experiment on LCD display:-Print numbers, Name, Time etc. • Experiments using Seven Segment display. • Experiments using Temperature, IR, Finger print sensors. • Experiments with Raspberry Pi using LED. • Interfacing of the LDR, IR sensors. • Experiments on the applications of Buzzer, potentiometer. • Design and development of Arduino/Raspberry Pi based system for defined application/ projects

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Name of The Course	Linear Algebra & Differential Equations	L	T	P	C
Course Code	BBS01T1003	3	0	0	3
Version No					
Prerequisite					
Co requisite					
Anti- requisite					

Course Objectives

It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes

Upon successful completion of this course, students will be able to

CO1	Apply appropriate method to find inverse of a matrix and to solve system of linear equations.
CO2	Understand and apply vector space and linear transformation and its matrix representation.
CO3	Apply the knowledge of eigen value and eigen vector, diagonalization, inner product spaces and orthogonalization for solving various problems.
CO4	Apply appropriate methods to solve nth order linear ordinary differential equations
CO5	Classify partial differential equations and apply method of separation of variables to solve PDE.
CO6	Gain understanding of latest trends and research areas in the course

Text Books:

1. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2. Erwin Kreyszig,Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons.
3. Peter V. O'Neil,Advanced Engineering Mathematics, 7thEdition,Cengage Learning.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 4th Edition, Narosa Publishers.
2. Robert T. Smith and Roland B. Minton,Calculus, 4thEdition,McGraw Hill Education.
3. David C Lay,Linear Algebra and its application, 3rd Edition, Pearson Education

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Course Content

Unit-1	**Contact Hours:6**
Basic Operations on matrices and vectors, Determinants, Cramer Rule, Inverse of matrix using Gauss Jordan elimination, Rank of a matrix, Solution of system of linear equations: Gauss elimination.	
Unit-2	**Contact Hours:10**
Vector Space, Linear Independence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank, nullity, rank-nullity theorem, Inverse of a linear transformation, composition of linear maps, Matrix associated with a linear map.	
Unit-3	**Contact Hours: 9**
Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigen-bases, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.	
Unit-4	**Contact Hours: 9**
Basic concepts, Exact differential equations, Linear differential equations of second and higher order with constant coefficients, Method of variation of parameters, Cauchy-Euler equation, System of linear differential equations with constant coefficients, applications of linear differential equations.	
Unit-5	**Contact Hours: 8**
Basic concepts, Classification of second order linear PDE, Method of separation of variables and its application in solving Wave equation (one dimension), heat equation (one dimension) and Laplace equation (two dimension steady state only).	

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Name of The Course	Introduction to Digital Systems	L	T	P	C
Course Code	BEE01T1005	2	0	2	3
Version No					
Prerequisite					
Co requisite					
Anti- requisite					

Course Objectives

1. To familiarize with various Digital IC
2. To understand basic fundamentals of Digital circuits.
3. To prepare for various engineering applications.

Course Outcomes

Upon successful completion of this course, students will be able to

CO1	Solve the problems on Number system codes and their conversions.
CO2	Identify Digital IC and implement in the circuits.
CO3	Create, design and simulate canonical logic forms
CO4	Demonstrate the application of combinational and sequential logic circuits
CO5	Implement the basic circuits on embedded platform
CO6	Gain understanding of latest trends and research areas in the course

Text Book (s)

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Digital Electronics	R P Jain	McGraw Hill	2017	Second
2	Digital Logic and Computer Design	Morris Mano	PHI	2017 review	Second
3	Digital Electronic Principles-	Malvino	PHI	2011-13	Seventh

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Course Content

Unit-I: Number Systems & Boolean Algebra
Decimal, binary, octal, hexadecimal number system and conversion, binary weighted & non-weighted codes & code conversion, signed numbers, 1s and 2s complement codes, Binary arithmetic, Binary logic functions, Boolean laws, truth tables, associative and distributive properties, De-Morgan's theorems, realization of switching functions using logic gates. Logic families: TTL, ECL, CMOS.
Unit-II: Combinational Logic:
Switching equations(Mathematical operations), canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, mixed logic combinational circuits, multiple output functions, QuineMcluskey Methods for 5 variables. Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers & De-multiplexer, binary adder, Subtractor, BCD adder, carry look ahead adder, Binary comparator, Arithmetic Logic Units.
Unit-III: Sequential Logic & Circuits:
Latch, flip-flops, clocked and edge triggered flip-flops, timing specifications, asynchronous and synchronous counters counter design, Registers, types of registers. Analysis of simple synchronous sequential circuits

List of Experiment
• To study the basic logic gates
  • Verify their truth table.
  • Verification of De Morgan's Theorem.
• Verification Of SOP & POS Given Algebraic Expression Using Universal Gates.
• Designing of HALF and Full adder using basic logic gates.
• Design of 4:1 MULTIPLEXER USING GATES.
• Design and Implementation of 1-bit Magnitude Comparator using basic logic gates.
• Design and Verification of S-R Flip-Flop Circuits.
• Realization of 3-bit synchronous counter design For Various Application.
  • Frequency counters
  • Digital clock
  • Time measurement
• Project based learning: Building of LED Series / Seven Segment LED / Display unit.

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Name of The Course	Discrete Mathematics	L	T	P	C
Course Code	BBS01T1009	2	0	2	3
Version No					
Prerequisite					
Co requisite					
Anti- requisite					

Course Objectives

The objective of this course is to familiarize the prospective computer scientists with the techniques of mathematical reasoning, logical thinking, abstract mathematical discrete structures so that they may apply a particular set of mathematical facts in relevant situations.

Course Outcomes

Upon successful completion of this course, students will be able to

CO1	Apply rule of inference for connecting and validating logical statements and use proof techniques.
CO2	Use counting techniques to solve various counting problems.
CO3	Apply the concepts of sets, relation, functions and mathematical induction.
CO4	Classify the algebraic structures as Group, Ring, field.
CO5	Classify the structures of graph and tree and use them to simplify various problems.
CO6	Gain understanding of latest trends and research areas in the course

Text Book:

1. 1.Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill.
2. Susanna S Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc
3. C L Liu and Mohapatra, "Elements of Distcrete Mathematics", a computer oriented approach, 3rd edition, McGraw Hill.

Reference Books:

1. J P Trembley, R Manohar,Discrete Mathematical Structures and it's Application to Computer Science, TMG Edition, Tata McGraw-Hill.
2. Norman L Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
3. SemyourLipschutz and Marc Lipson , Schaum's Outlines Series.

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Course Content

Unit-1	**Contact Hours:8**
Syntax, Semantics, Validity and Satisfiability, Basic connectives and Truth Tables, Logical Equivalance, ,the laws of logic, Logical implication, Rules of inference,Normal form(CNF,DNF), Predicate logic, Universal and Existantial quantifiers, skolemization. Proof Techniques: Some terminologies, Proof methods and strategies, Forward proof, Proof by contradiction, Proof by contraposition, Proof of necessity and sufficiency.	
Unit-2	**Contact Hours:6**
Counting Techniques: Basic counting techniques, inclusion and exclusion, pigeon-hole principle, permutation and combination	
Unit-3	**Contact Hours: 12**
Operations and laws of sets**,** Cartesian product, binary relation, partial order relation, Equivalence relation, Functions, Bijective function, inverse and composition of function, size of a set, countable and uncountable set, Cantor's diagonal argument and the power set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The well -Ordering principle, Recursive definition, prime numbers, greatest common divisor, Euclidean algorithm, the fundamental theorem of arithmetic.	
Unit-4	**Contact Hours: 10**
Algebraic structures with one binary operation: Semi Group, Monoid, Groups, Subgroups, Congruence relation and quotient structures, Free and Cyclic Monoid and Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism, Algebraic structures with two binary operation: Ring ,Integral domain and Field.	
Unit-5	**Contact Hours: 6**
Graphs and their properties, degree, connectivity, path cycle, sub graphs, isomorphism, Eulerian and Hamiltonian walks, Graph coloring, coloring maps and planer graphs, coloring vertices and edges, list coloring, perfect graph. Trees: Definitions, properties and examples, rooted trees, trees and sorting, weighted trees and prefix codes, bi-connected components and articulation points, shortest distances.	

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Name of The Course	OOPS	L	T	P	C
Course Code	BCS01T1006	1	0	2	2
Version No					
Prerequisite	Basic programming Languages				
Co requisite					
Anti- requisite					

Course Objectives

The purpose of this course is to provide basic concepts of Object-oriented programming with C++. The main goal of the course is to teach the students how to Apply the OOPS concepts in various applications that are appropriate for problems that they might encounter. This course is also to teach constructors, destructors, inheritances, polymorphism, virtual function and control structures. This also provides knowledge of input output stream functions.

Course Outcomes

Upon successful completion of this course, students will be able to

CO1	Understand an Object-Oriented Programming Features.
CO2	Analyze and apply the role of constructors &destructors in program design.
CO3	Understand the concept of Exception Handling.
CO4	Apply the concept of inheritances, polymorphism and virtual function for problem solution
CO5	Apply the different input output streams for problem solution.
CO6	Understanding of latest advances and its applications in Computer Programming and Problem Solving.

Text Book (s)

1. Object Oriented Programming with C++ - Rajiv Sahay, Oxford Mastering C++ - Venugopal, McGraw-Hill Education (India)
2. Herbert Schildt, C++ - The Complete Reference, Third Edition -Tata McGraw Hill - 1999.
3. Bruce Eckel, Thinking in C++, Second Edition, Volume One, Pearson Education Asia, 2000.

Reference Book (s):

1. Object Oriented Programming in C++ by Robert LaforeTechmedia Publication.
2. Object Oriented Programming in C++ SauravSahay Oxford University Press.
3. Object Oriented Programming in C++ R Rajaram New Age International Publishers 2nd.
4. OOPS C++ Big C++ Cay Horstmann Wiley Publication.
5. C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
6. C++ and Object-Oriented Programming – Jana, PHI Learning.

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Course Content

Unit I: Introduction: Basic Terminology	**8 lecture hours**
Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism. Introduction to C++ – classes – access specifiers – function and data members – default arguments – function overloading – friend functions – const and volatile functions - static members – Objects – pointers and objects – constant objects – nested classes – local classes.	
Unit II: Constructor & Destructor	**8 lecture hours**
Constructors – default constructor – Parameterized constructors – Constructor with dynamic allocation – copy constructor – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion – explicit constructor.	
Unit III: Exception Handling	**8 lecture hours**
Function and class templates - Exception handling – try-catch-throw paradigm – exception specification – terminate and unexpected functions – Uncaught exception.	
Unit IV: Inheritance	**8 lecture hours**
Inheritance – public, private, and protected derivations – multiple inheritance - virtual base class – abstract class – composite objects Runtime polymorphism – virtual functions – pure virtual functions – RTTI – typeid – dynamic casting – RTTI and templates – cross casting – down casting	
Unit V: I/O STREAMS	**8 lecture hours**
Streams and formatted I/O – I/O manipulators - file handling – random access – object serialization – namespaces - std namespace – ANSI String Objects – standard template library	
Unit-6: Advances in C++ Programming	**7 hours**
The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered in the course.	

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Name of The Course	Computer Workshop	L	T	P	C
Course Code	BCS01T1004	1	0	2	2
Version No					
Prerequisite					
Co requisite					
Anti- requisite					

Course Objectives

Students of Computer Engineering have to work with various hardware and software not only during academia but also in company. Thus, students should get familiar with various hardware, software, operating systems and networking.

This course will provide student a much-needed knowledge of computer hardware and networking, enabling them to identify and rectify the onboard computer hardware, software and network related problems. With the help of this course the student will be able to understand the hardware specifications that are required to run operating system and various application programs.

Course Outcomes

Upon successful completion of this course, students will be able to

CO1	Understand the basic concept and structure of computer hardware and networking.
CO2	Identify the existing configuration of the computers and peripherals.
CO3	Upgrading the system as and when required.
CO4	Apply their knowledge about computer peripherals to identify / rectify problems onboard.
CO5	Integrate the PCs into local area network and re-install operating system and various application programs.
CO6	Manage data backup and restore operations on computer and update application software.

Reference Book (s)

1. Hardware Bible by Winn L. Rosch
2. Hardware and Software of Personal Computers by Sanjay K. Bose
3. Fundamentals of Computers by V. Rajaraman
4. Computer Studies - A first course by John Shelley and Roger Hunt
5. Computer Fundamentals, MS Office and Internet & Web Technology by Dinesh Maidasani
6. Modern Computer Hardware Course by M Lotia, P Nair, P Lotia

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Course Content

Assembly of Computer:	**6 Hour**
Introduction to hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Working of SMPS. Study of various ports. Steps and precautions to assemble computer.	
Assembly of Laptop:	**4 Hours**
laptop hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Study of various ports. Steps and precautions to assemble laptop.	
Computer Network Tools:	**4 Hours**
Introduction to computer network. Study of various topologies. Preparing the network cable using crimping tools and connectors. Study of various network environments.	
Operating System and Software Installations:	**6 Hours**
Introduction to operating system. Types of operating system (Windows and Linux). Window: -Evolution of operating system. Introduction to software. Types of software (MS office, VLC media player, Win rar), etc. Linux: - Evolution of operating system. Introduction to software. Types of software (open office, web browser, etc.) Case study of Installations step for operating system and application software's.	
Internet:	**4 Hours**
Introduction and evolution of internet. Study of various internet-based services like email, social network, chat, etc. Introduction to cyber security and cyber laws.	
Server:	**4 Hours**
Introduction to server. Difference between server and normal desktop. Evolution of servers. Study of various servers like email, data, domain, etc.	
List of Experiments: The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire the competency. Following is the list of experiments for guidance. As it is laboratory course list is as per content given above	

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Name of The Course	Alexa Skilling	L	T	P	C
Course Code	BCS01T1007	0	0	2	0
Version No					
Prerequisite					
Co requisite					
Anti- requisite					

Course Objectives

1. To introduce the student to the idea of voice assistant devices
2. To provide a foundation to create Alexa skills

Course Outcomes

Upon successful completion of this course, students will be able to

CO1	Understand the basic concepts of Alexa
CO2	Understand Alexa Skill Set
CO3	Design an engaging Voice User Interface
CO4	Setting Up AWS
CO5	Create Alexa skills.

Text Book (s)

1. Build your own Alexa skill by Andrew Odewahn, Brian Jepson Publisher(s): O'Reilly Media, Inc.ISBN: 9781491974650
2. Alexa Skills Projects, By Madhur Bhargava, Packt

Reference Book (s):

1. Hands-On Chatbot Development with Alexa Skills and Amazon Lex,Sam Williams ,Packt

Course Content

Unit 1: Introduction to Alexa
Intro to Alexa , The future of voice-based experiences , Overview of Echo, Alexa.
Unit 2: Alexa Skill Set
Build Alexa Skills, Why you should build Alexa skills, What type of Alexa skills you can create, How an Alexa skill works, The steps to build a skill, The requirements to build a skill.
Unit 3: Design an Engaging Voice User Interface
How users interact with Alexa, Voice design concepts: utterances, intents, slots, interaction model and situational design, Characteristics of a well-designed voice user interface (VUI), Key challenges of voice design.
UNIT4: Setting up AWS
Setting Up Your Alexa Skill in the Developer Portal , Setting Up A Lambda Function Using Amazon Web Services, Connecting Your Voice User Interface To Your Lambda Function.
Unit 5 : Creating alexa skills
Fact Skill,Quiz Skill & Project on Alexa Skill
Unit-6 AI in Practice
Visualizing Statistical Relationships, Plotting with Categorical Data, Visualizing the Distribution of a Dataset.

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