Department of
ELECTRONICS AND COMMUNICATION ENGINEERING

4 Years B.Tech Degree Programme

REGULATION & SYLLABUS 2017

Choice Based Credit System
Outcome Based Assessment

SEMESTER-III& IV

AUTONOMOUS

Accredited by NBA

Accredited by NAAC with 'A' Grade (3.28 out of 4.00 CGPA)

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Affiliated to UGC New Delhi & Biju Patnaik University of Technology, Odisha

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates of the program will have a successful career of mechanical engineering by imparting Mechanical Engineering concepts and practical knowledge.

PEO2: Graduates of the program will pursue higher education and research in the field of mechanical engineering.

PEO3: Graduates of the program will exhibit Scientific and Engineering expertise and perform as a Professional Entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Ability to apply the acquired Mechanical Engineering knowledge for the development of composite materials for societal application.

PSO 2: Ability to implement the learned principles of Mechanical Engineering to analyze, evaluate and create more advanced mechanical systems by using state-of-art facilities.

PROGRAMME OUTCOMES (POs)

PO-1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO-2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3. Design / Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO- 4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO- 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO- 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO- 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO- 9. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11. Project management and finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

III SEMESTER [SECOND YEAR]

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C	QP
THEORY								
1	PC	BECPC3010	Analog Electronic Circuits	3	1	0	4	A
2	PC	BELPC3020	Network Theory	3	0	0	3	A
3	PC	BEIPC3030	Electrical and Electronic Measurements	3	0	0	3	A
4	BS	BBSBS3040	Engineering Mathematics-III	3	1	0	4	A
5	ES	BCSES3050	Object Oriented Programming through JAVA	3	0	0	3	A
6	BS / HS	BBSBS3061	Environmental Engineering and Safety	3	0	0	3	A
		BMSHS3062	Engineering Economics and Costing					
PRACTICAL / SESSIONAL								
7	PC	BECPC3110	Analog Electronic Circuits Laboratory	0	0	2	1	-
8	PC	BELPC3120	Network and Devices Laboratory	0	0	2	1	-
9	PC	BEIPC3130	Electrical and Electronic Measurements Laboratory	0	0	2	1	-
10	ES	BCSES3150	JAVA Programming Laboratory	0	0	2	1	-
TOTAL				**18**	**2**	**8**	**24**	

IV SEMESTER [SECOND YEAR]

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C	QP
THEORY								
1	PC	BECPC4010	Digital Electronics	3	1	0	4	A
2	PC	BEEPC4020	Control Systems	3	0	0	3	A
3	PC	BECPC4030	Microprocessors and Microcontrollers	3	0	0	3	A
4	PC	BECPC4040	Semiconductor Devices	3	1	0	4	A
5	ES	BCSES4050	Database Management Systems	3	0	0	3	A
6	BS / HS	BBSBS3061	Environmental Engineering and Safety	3	0	0	4	A
		BMSHS3062	Engineering Economics and Costing					
PRACTICAL / SESSIONAL								
7	PC	BECPC4110	Digital Electronics Laboratory	0	0	2	1	-
8	PC	BEEPC4120	Control Systems Laboratory	0	0	2	1	-
9	PC	BECPC4130	Microprocessors and Microcontrollers Laboratory	0	0	2	1	-
10	ES	BCSES4150	Database Management Systems Laboratory	0	0	2	1	-
TOTAL				**18**	**2**	**8**	**24**	

Analog Electronics Circuits

Subject Code	L	T	P	C	QP
BECPC3010	**3**	**1**	**0**	**4**	**A**

Pre -Requisite: A student should have basic idea on electronic components and also should have clear concept on KCL & KVL.

Course Educational Objective

CEO1: Prepare the students to perform the analysis of analog electronic circuits.

CEO2: Empower the students to understand the design and working of different types of amplifiers.

Course Outcome

At the end of this course students will be able to demonstrate the ability to

CO1 Understand the characteristics of transistors.

CO2 Design and analyze various amplifier circuits.

CO3 Describe the effect of negative feedback, low & high frequency response and gain-bandwidth relationship for amplifier scheme.

CO4 Understand the functioning of OP-AMP and design OP-AMP based circuits.

CO5 Use the effect of positive feedback to model oscillators.

CO6 Examine the efficiency of different class of power amplifiers.

UNIT:1 **(12 Hours)**

Biasing of BJTs: Introduction; Operating Point; Fixed Bias; Emitter Bias; Voltage-Divider Bias; DC Bias with Voltage Feedback; Miscellaneous Bias Configurations; Design Operations; Bias Stabilization. **(4 Hours)**

Field-Effect Transistors: Introduction; Basic Construction, Operation and Characteristics of JFETs and MOSFETs; CMOS. **(4 Hours)**

Biasing of FETs: Fixed-Bias Configuration; Self-Bias Configuration; Voltage-Divider Biasing; Design. **(4 Hours)**

UNIT:2 **(12 Hours)**

Small Signal Analysis of BJTs: BJT Transistor Modeling; The r_e Transistor model; The Hybrid Equivalent Model: Small-Signal Analysis of CE, CB, and CC Amplifiers; Emitter Follower Configuration; Effect of R_L and R_S; Two-Port Systems Approach; Cascaded Systems; Darlington Connection; Current Mirror Circuits. (6 Hours)

Small Signal Analysis of FETs: FET Small-Signal Model, Small-Signal Analysis of CS, CD, CG Amplifiers. Effect of R_L and R_{sig}; Cascade Configuration. (6 Hours)

UNIT:3 **(5 Hours)**

Frequency Response of BJTs and FETs: Low and High Frequency Response of BJTs and FETs; Frequency Response of CE Amplifier; Frequency Response of CS Amplifier; Miller Effect Capacitance; Multistage Frequency Effects; Square Wave Testing.

(5 Hours)

UNIT:4 **(12 Hours)**

Operational Amplifiers: Differential Amplifier Circuit; Op-Amp Basics; Practical Op-Amp Circuits; Op-Amp Parameters; Op-Amp Parameters; Op-Amp Applications; Instrumentation Amplifier; Active Filters. (5Hours)

Power Amplifiers: Classifications; Class-A and Class-B Amplifier Circuits, Transfer Characteristics, Power Dissipation and Conversion Efficiency of Power Amplifiers.

(3 Hours)

Feedback Amplifiers and Oscillators: Feedback Concepts; Feedback Connection Types; Practical Feedback Circuits; Feedback Amplifier Stability using Nyquist Plot; Basic Principle of Sinusoidal Oscillator; Phase-Shift, Wien-Bridge and Crystal Oscillator.

(4 Hours)

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

Electronic Devices and Circuit Theory, R. L. Boylestad and L. Nashelsky, Pearson Education, New Delhi, 9th/10th Edition, 2013. (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14)

Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2nd Edition, 2008.

Microelectronics Circuits, 5th Edition, International Student Edition Sedra and Smith, Oxford University Press, New Delhi.

Ref. Books

1. Electronic Devices and Circuits, 3rd Edition, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi.

2. Electronics Circuits Analysis and Design, 3rd Edition, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi.

3. Microelectronic Circuits: Analysis and Design, India Edition, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc.

CO - PO Matrix of CourseAnalog Electronics Circuits

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
C1	3	3	1	1	-	-	-	-	-	2	-	1	-	-	-
C2	3	2	1	1	-	-	-	-	-	2	-	-	-	-	-
C3	3	3	3	2	-	-	-	-	-	3	-	-	-	-	-
C4	3	3	3	3	1	-	-	-	-	2	-	1	1	1	1
C5	3	3	3	3	1	1	-	-	-	2	-	2	-	-	-
C6	3	3	3	2	1	1	-	-	-	2	-	2	1	1	-
Average	3	2.83	2.33	2	1	1	0	0	0	2.16	0	1.5	1	1	1

Electrical and Electronics Measurement

Subject Code	L	T	P	C	QP
PEI3I102	3	0	2	4	

Pre -Requisite:

Course Educational Objective

CEO1:To impart students the skill of technically employing different types of meter.

CEO2: To prepare students for monitoring, analyzing and calibrating any physical system.

CEO3:To provide students knowledge of practicing modern tools for implementing electrical and electronics projects.

Course Outcome

At the end of the course, students will be able to:

CO1 Define the measurement of electrical phenomena like R, L & C which characterize the behavior of electrical and electronic circuits.

CO2 Estimate various properties of measurands in measurement system.

CO3 Operate numerous measurement systems to meet desire needs in instrumentation engineering.

CO4 Examine and conduct experiments to evaluate , power, Power factor, energy

CO5 Assemble different components and design various types of ac & dc bridges.

CO6 Estimate and justify the validity of all kind of laboratory instruments in the field of measurement.

UNIT:1(11 Hrs)

INTRODUCTION: Measurement*,* Static characteristics- Accuracy, Precision, Significant

Figures, Resolution, sensitivity, linearity and error, Types of Errors. Classification of Standards, IEEE Standards.

MEASUREMENT OF RESISTANCE: Measurement of Low Resistance by Kelvin's Double Bridge, Measurement of Medium Resistance by Wheatstone bridge, ammeter-voltmeter and substitution method, Measurement of High Resistance by loss of charge and Megger method, Measurement of Insulation Resistance when Power is ON, Measurement of Resistance of Earth Connections.

MEASUREMENT OF INDUCTANCE: Measurement of Self Inductance by Ammeter and

Voltmeter method and AC Bridges(Maxwell's, Hay's, & Anderson Bridge), Measurement of Mutual Inductance by Felici's Method, and as Self Inductance.

MEASUREMENT OF CAPACITANCE*:* Measurement of Capacitance by Ammeter and Voltmeter and AC Bridges (Owens's, Schering), Wein's bridge, Screening of Bridge Components and Wagner Earthing Device.

UNIT:2 **(15 Hours)**

GALVANOMETER: Construction, Theory, Principle of operation and constants of D'Arsonval galvanometer, Influence of Resistance on Damping, Logarithmic decrement Construction, Theory and Principle of operation of Vibrational galvanometer, Construction, theory, Principle of operation and calibration of Ballistic Galvanometer, Measurement of Flux.

AMMETER and VOLTMETER: Construction, Theory, Principle of operation of PMMC, MI (attraction and repulsion types), Electro Dynamometer.

POTENTIOMETER: Construction, Theory and Principle of operation of DC Potentiometer (Crompton), Construction, Theory and Principle of operation of AC Potentiometer (Drysdale-Tinsley)

UNIT:3 **(8 Hours)**

MEASUREMENT OF POWER: Measurement of single phase and three phase power by wattmeter, Construction, Theory and Principle of operation of Electro-Dynamometer and Induction type Watt meters.

MEASUREMENT OF ENERGY: Single Phase Watt-hour meter.

MEASUREMENT OF FREQUENCY: Electrical resonance and ratio meter type frequency meter.

MEASUREMENT OF POWER FACTOR: Single Phase power factor meter.

UNIT:4 **(6 Hours)**

CURRENT TRANSFPRMER and POTENTIAL TRANSFOMER: Construction, Theory, Characteristics of CT, PT, Q-meter.

COUNTERS & ANALYZERS: Introduction to Wave, Harmonic Distortion and Spectrum Analyzers, Frequency Counters, Testing an Audio Amplifier.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

Electrical Measurements and Measuring Instruments – Golding &Widdis – 5th Edition, Reem Publication.

Modern Electronic Instrumentation and Measurement Techniques – Helfrick& Cooper – Pearson.

Reference Books:

A Course in Electrical and Electronic Measurements and Instrumentation – A K Sawhney – Dhanpat Rai & Co.

Electronic Instrumentation – H C Kalsi – 2nd Edition, Tata McGraw Hill.

CO - PO Matrix of CourseElectrical and Electronics Measurement

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
C1	3	2	1	1	-	1	2	2	-	2	2	3	2	1	1
C2	2	2	1	3	2	1	-	1	-	2	2	2	2	1	-
C3	3	-	1	-	2	1	2	1	3	2	1	3	1	2	2
C4	3	3	2	3	1	2	1	-	3	3	1	2	-	3	1
C5	1	2	3	2	2	3	1	1	3	2	1	-	2	3	1
C6	1	2	-	1	1	2	2	1	2	3	2	2	1	1	-
Average	2.16	2.2	1.6	2	1.6	1.66	1.6	1.2	2.75	2.33	1.5	2.4	1.6	1.83	1.25

ENGINEERING MATHEMATICS-III

Subject Code		L	T	P	C	QP
BBSBS3050	**Course Educational Objective**	3	1	0	4	

Course Outcomes

Pre-Requisites (If any) –

CO1 To execute the technique of series for solving ordinary differential equation.

CO2 To Evaluate a contour integral using Cauchy's integral formula and to Compute singularities and also the residues.

CO3 To apply numerical methods in Engineering Mathematical Problems.

Unit:1 SPECIAL FUNCTIONS : (12 hours)

Beta and Gamma functions, relation between Beta and Gamma functions, Error function, Series solution of differential equations (up to second order), Legendre equation, Legendre polynomials and their properties, Bessel's function.

Unit:2 Complex Analysis: **(12 hours)**

Analytic function, Cauchy-Riemann equations, Laplace equation, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

Unit:3 (12 hours)

Taylor's series, Laurent's series, Singularities and zeros, Residue integration, evaluation of real integrals.

Unit:4 Numerical methods:(14 Hours)

Approximation and round of errors, Roots of equation: fixed point iteration, the Newton-Raphson method. Interpolation: Lagrange Interpolation,Newton divided difference interpolation, Newton's forward and backward interpolation. Numerical Differentiation, Numerical integration: The trapezoidal rule, The Simpson's rules, Ordinary differential equation: Euler's method, modified Euler's method.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.

Text Books

E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India

Numerical method for Engineers by M. K. Jain and Iyenger.

Reference Books

Higher Engineering Mathematics by B S Grewal : Khanna Publishers, New Delhi.

Numerical Analysis by Dutta and Jena

COURSE OUT COMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	_	-	_	-	_	2	_	_	3
CO2	3	3	3	_	-	_	-	_	2	_	_	2
CO3	3	3	3	_	-	_	_	_	3	_	_	3

OOPS Through JAVA

Subject Code	L	T	P	C	QP
BCSPC3030	**3**	**0**	**0**	**3**	

Pre -Requisite:

Course Educational Objective

CEO1: The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism

CEO2:Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections

CEO3: How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.

CEO4: How to test, document and prepare a professional looking package for each business project using javadoc.

Course Outcome: At the end of the course, the student will be capable of

CO1	Students will be able to map real world problems into the Programming language with oop features and Implement object oriented principles for reusability.
CO2	Students will be able to write programs using basic data types and strings, using loops, Array.
CO3	Student will be able to Assign priorities and resolve run-time errors with Multithreading and Exception Handling techniques
CO4	Students will be able to Interpret Events handling techniques for interaction of the user with GUI and Develop client/server applications using socket programming

UNIT:1 **(12 Hours)**

An introduction Object Oriented Programming, Features of Object Oriented Programming Introduction to Java. Difference between C/C++ and Java, Features of Java, First Java Program, Writing the java program, Compiling the program, JVM and its significance in executing a program?, Architecture of JVM. Understanding, Java Tokens, Datatypes, Operators, Control Structures and Arrays, Conditional Statements, Loops/ Iterators, Jumping Statements, Java Arrays, Multidimensional Arrays, Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.

UNIT:2 **(14 Hours)**

Introduction to Classes and Objects. Constructors, static Keyword , this Keyword, Array of Objects, Access Modifiers (Public, Private, Protected, Default). Inheritance ,Types of Inheritance and Java supported Inheritance, super, Polymorphism, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching. String Manipulations. Wrapper classes, Auto boxing and unboxing. Abstract classes, Interfaces, Multiple Inheritance Using Interfaces,

Java API Packages, User-Defined Packages, Accessing Packages, Error and Exception Handling, Types of exceptions Hierarchy of Exception classes, try, catch, finally, throw, throws, Commonly used Exceptions and their details ,User defined exception classes.

UNIT:3 (**14 Hours**)

Multithreading, Thread in Java, Thread execution prevention methods. (yield(), join(), sleep()), Concept of Synchronization, Inter Thread Communication, Basics of Deadlock, Demon Thread, Improvement in Multithreading, Inner Classes, Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class.

IO Streams (java.io package) , Byte Stream and Character Stream, Files and Random Access Files, Serialization, Collection Frame Work (java.util), Util Package interfaces, List, Set, Map.

UNIT:4 **(14 Hours)**

Applet Introduction, Life Cycle of an Applet, GUI with an Applet, Abstract Window Toolkit (AWT), Introduction to GUI, Description of Components and Containers, Component/Container hierarchy, Understanding different Components/Container classes and their constructors, Event Handling, Different mechanisms of Event Handling, Listener Interfaces, Adapter classes.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1 Programming in Java. Second Edition. Oxford Higher Education. (Sachin Malhotra/ Saurav Choudhary)

2 Core Java For Beginners. (Rashmi Kanta Das), Vikas Publication

Ref. Books 1.JAVA Complete Reference (9th Edition) Herbalt Schelidt

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
OOPS Through JAVA

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1		1							
CO2	2	1	2	2	1							
CO3	2	2	2	2	1							
CO4	3	3	2	3	3	1	1					

Engineering Economics & Costing

Subject Code	L	T	P	C	QP
BMGHS3061	3	0	0	3	-

Pre -Requisite:

Course Educational Objective

CEO1: to understand the significance of the economic aspects of engineering and to become proficient in the evaluation of engineering proposals in terms of worth and cost

CEO2: to help students to grasp various economics concepts and theories towards making economic decision.

Course Outcome

CO1 Understanding the fundamentals of economic theory in general- concept of demand & supply, theories of production-Laws of returns

CO2 Overview of cost and revenueconcepts: Understood the nature and behavior of cost, cost sheet, Break-even analysis- linear approach and understanding of depreciation with its measurement.

CO3 Acquainted with evaluation of engineering proposals(Private and public) by learning the concept of Time-value of Money, Determination of economic life of an asset, Replacement of existing asset with a new asset etc.

CO4 Familiar with Indianfinancial system and banking structure, idea about concept of national income –its measurement and inflation.

CO5 Ultimately learners of the subject get the benefits of understanding the diverse situation happening in the economy and able to make rational decision in the field of engineering.

UNIT:1 **12hrs**

Engineering Economics –

Meaning, Nature, Scope, Basic problems of an economy, Micro economics and Macro Economics.

Demand and Supply Analysis -

Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand &its measurement (Simple numerical problems to be solved)

Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of

supply, Determination of market equilibrium (Simple numerical problems to be solved).

Theory of Production -Production function, Laws of returns: Law of variable proportion, Law of returns to scale.

UNIT:2 **10hrs**

Cost and revenue concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into Fixed and variable costs. Basic understanding of different market structures, Price and output Determination under perfect competition (Simple numerical problems to be solved),

Break Even Analysis -

Linear approach (Simple numerical problems to be solved). Depreciation-Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method)

UNIT:3 **12hrs**

Time value of money -

Interest Analysis - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-

Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects. Sensitivity Analysis, Replacement Analysis- Determination of economic life of an asset, Replacement of existing asset with a new asset.

UNIT:4 **10 hrs**

Overview of Indian financial system. Commercial bank, Functions of commercial bank, Credit creation, Central bank, Functions of Central Bank. Inflation-

Meaning of inflation, types, causes, measures to control inflation.

National Income - Definition, Concepts of national income, Method of measuring national income

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1, Vengedasalam, Deviga. Madhavan, Karunagaran, Principles of Economics, Oxford University Press.

2. R. Paneer Seelvan, " Engineering Economics", PHI

3. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd

4. Riggs,J.L., Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India

5.Paul, R.R., Money, Banking and International Trade, Kalyni Publishers.

Ref. Books

1.Park, Chan.S, "Fundamental of Engineering Economics", Pearson.

2. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson

3. Thuesen, G.J.,Fabrycky,. Engineering Economy, PHI.

4.Jhingan,M.L., "Macro Economic Theory", Vrinda Publications Ltd

CO - PO Matrix of Course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C1	3	2	1	1		1	2	1		2	2	3
C2	2	2	1	3	2	1		1		2	2	2
C3	3	2	1	1	2	1	2	1	3	2	1	3
C4	3	3	2	3	1	2	1	1	3	3	1	2
C5	1	2	3	2	2	3	1	1	3	2	1	1
C6	1	2	2	1	1	2	2	1	2	3	2	2
Average	2.16	2.16	1.66	1.83	1.6	1.66	1.6	1	2.75	2.33	1.5	2.16

ANALOG ELECTRONIC LABORATORY

Subject Code	L	T	P	C	QP
BECPC3110	**0**	**0**	**2**	**1**	

Pre -Requisite: A student should have basic idea on electronic components

Course Outcome

At the end of this course students will be able to demonstrate the ability to

CO1 Define the VI characteristics of biasing circuits using project boards

CO2 Identify different analog circuits and their behaviors.

CO3 Compare the practical results with the assumed data values.

CO4 Design and test of different amplifier and oscillator circuits

List of Experiments

(At least 10 out of 12 experiments should be done)

BJT Bias Circuit - design, assemble and test.

JEET/MOSFET Bias Circuit - design, assemble and test.

Design, assemble and test of BJT Common-Emitter Circuit: DC and AC performance.

Study of Darlington Connection and Current Mirror Circuits.

Design, assemble and test of JFET/MOSFET Common-Source Circuit: DC and AC performance.

Frequency Response of a Common-Emitter Amplifier: low frequency, high frequency and mid frequency response.

Differential Amplifiers Circuit: DC bias and AC operation without and with current source.

Op-Amp Frequency Response and Compensation.

Application of Op-Amp as differentiator, integrator, square wave generator.

Square wave testing of an amplifier.

R-C Phase Shift oscillator/Wien-Bridge Oscillator using OP-Amp/Crystal Oscillator.

Class A and Class B Power Amplifier.

CO - PO Matrix of Course

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C1	3	2	2	2	1	-	-	-	-	2	-	-	-	-	-
C2	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-
C3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
C4	3	3	2	2	1	-	-	-	-	2	-	-	-	-	-
Average	3	2.5	2.25	1.75	1	0	0	0	0	2	0	1	-	-	-

ELECTRICAL & ELECTRONICS MEASUREMENT LABORATORY

Subject Code	L	T	P	C	QP
PEI3I102	**3**	**0**	**2**	**4**	

Pre -Requisite:

Course Educational Objective

CEO1:To impart students the skill of practicallyhandling different types of meter.

CEO2:To prepare students for monitoring, analyzing and calibrating any physical instrument.

CEO3:To provide students a knowledge of practicing modern tools for implementing electrical and electronics projects.

Course Outcome

At the end of the course, students will be able to:

CO1 State the construction and working of different mechanical instruments.

CO2 Recognize the different types of interferences, their causes and methods of reduction.

CO3 Employ various types of ac and dc bridges for measurement

CO4 Examine watt meters and energy meters to test their accuracy.

CO5 Collect different components and design of various ac & dc bridges.

CO6 Justify the validity of all kind of laboratory instruments in the field of measurement.

LIST OF EXPERIMENTS:

Measurement of Low Resistance by Kelvin’s Double Bridge Method.

Measurement of Self Inductance by Anderson Bridge.

Measurement of capacitance using Schering Bridge.

Study of Galvanometer and Determination of Sensitivity and Galvanometer Constants.

Calibration of Voltmeters and Ammeters using Potentiometers.

Testing of Energy meters (Single phase type).

Measurement of Iron Loss from B-H Curve by using CRO.

Measurement of R, L, and C using Q-meter.

Measurement of Power in a single phase circuit by using CTs and PTs.

Measurement of Power and Power Factor in a three phase AC circuit by two-wattmeter method.

Study of Spectrum Analyzers.

CO - PO Matrix of Course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C1	2	1	1	-	1	2	2	2	2	1	1	3	-	2	1
C2	3	2	2	2	1	2	3	2	2	2	2	3	-	1	-
C3	3	2	1	1	2	3	-	1	1	2	1	2	2	3	1
C4	3	3	-	3	2	1	1	-	3	-	1	-	1	3	1
C5	3	1	3	2	3	3	3	2	3	2	2	2	2	3	1
C6	2	1	2	-	2	1	2	1	2	3	2	2	1	1	-
Average	2.66	1.66	1.8	2	1.83	2	2.2	1.6	2.16	2	1.5	2.4	1.5	2.16	1

JAVA Programming Laboratory

Subject Code	L	T	P	C	QP
PEI3I102	**3**	**0**	**2**	**4**	

Pre -Requisite:

Course Educational Objective

CEO1: To introduce the pure object-oriented concepts through Java programming.

CEO2: To enable a detailed insight into the Java programming concepts such as creating classes, Methods, Interfaces, Packages, Multithreaded Environment, String handling, Enumerations, Creating small Swing application.

Course Outcome

At the end of the course, students will be able to:

CO1 Apply the object-oriented concepts through Java language.

CO2 Demonstrate the concepts of polymorphism and inheritance.

CO3 Write Java programs to implement error handling techniques using exception handling

Employ various types of ac and dc bridges for measurement

CO4 Develop solution for a real problem using Java programming.

JAVA programs on:

1. Introduction, Compiling & executing a java program.

2. Data types & variables, decision control structures: if, nested if etc.

3. Loop control structures: do, while, for etc.

4. Classes and objects.

5. Data abstraction & data hiding, inheritance, polymorphism.

6. Threads, exception handlings and applet programs

7. Interfaces and inner classes, wrapper classes, generics

DIGITAL ELECTRONICS

Subject Code	L	T	P	C	QP
BECPC 4010	**3**	**1**	**0**	**4**	

Pre -Requisite: A student should have basic idea on logic gates

Course Educational Objective

CEO1: To acquire the basic knowledge of digital logic levels and implements it in digital electronics.

CEO2: Prepare the students to perform the analysis and design of various digital electronic circuits.

Course Outcome

At the end of this course students will be able to demonstrate the ability to

CO1 Understand working of logic families and logic gates.

CO2 Recognize and study various number systems and their application in digital design.

CO3 Design and implement combinational logic circuits.

CO4 Design and analyze sequential logic circuits.

CO5 Employ PLDs to execute the given logical problem.

CO6 Establish the process of analog to digital conversion and digital to analog conversion.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
JAVA PROGRAMMING LAB

Course outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-		-	-	-	-	-	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-
CO4	3	3	3	2		1	-	-	-	-	-	-

UNIT: I **8 Hours**

Number Systems and Codes: Binary, Octal, Hexadecimal and Decimal Number System and their Conversion; Representation of Signed Binary and Floating Point Number; Binary Arithmetic using 1's and 2's Complements, Binary Codes - BCD Code, Gray Code, ASCII Character Code.

(5 Hours)

Boolean Algebra and Logic Gates: Axioms and Laws of Boolean Algebra; Reducing Boolean Expressions; Logic levels and Pulse Waveforms; Logic Gates; Boolean Expressions and Logic Diagrams. (3 Hours)

UNIT: II **9 Hours**

Gate-level Minimization: Canonical and Standard Forms; K-maps - Two, Three and Four Variable K-maps, Don't-Care Conditions; NAND and NOR Implementation; Other Two-Level Implementations, Exclusive-OR Function. (4 Hours)

Combinational Logic: Combinational Circuits; Analysis Procedure; Design Procedure; Adders; Subtractors; Parallel Binary Adders; Binary Adder-Subtractor; Binary Multiplier; Magnitude Comparator; Decoders; Encoders, Multiplexers; De-multiplexers.
(5 Hours)

UNIT: III **14 Hours**

Synchronous Sequential Logic: Sequential Circuits; Latches, Flip-Flops; Master-Slave Flip-Flop; Conversion of Flip-Flops; Analysis of Clocked Sequential Circuits; Mealy and Moore Models of Finite State Machines. (6 Hours)

Registers and Counters: Shift Registers; Data Transmission in Shift Registers; SISO, SIPO, PISO and PIPO Shift Registers; Counters; Asynchronous Counters; Design of Asynchronous Counters; Synchronous Counters; Design of Synchronous Counters; Ring Counter.
(8 Hours)

UNIT: IV **14 Hours**

Memory and Programmable Logic: Introduction; Random-Access Memory; Memory Decoding; Error Detection and Correction; Read-Only Memory; Programmable Logic Array; Programmable Array Logic; Sequential Programmable Devices.
(5 Hours)

Analog-to-Digital and Digital-to-Analog Converters: Digital-to-Analog Converters - R-2R Ladder D/A Converter, Weighted Resistor D/A Converter; Analog-to-Digital Converters - Counter-type A/D Converter, Parallel Comparator A/D Converter, Dual-Slope A/D Converter, Successive-Approximation A/D Converter, A/D Converter using Voltage-to-Frequency.
(5 Hours)

IC Logic Families: Special Characteristics; RTL, DTL, TTL, ECL, IIL, MOS and CMOS Logic Circuits. (4 Hours)

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

Digital Design, 3rd Edition, M. Morris Mano, Pearson Education.

Digital Fundamentals, 5th Edition, T. L. Floyd and R. P. Jain, Pearson Education, New Delhi.

Fundamentals of Digital Circuits, 8th Edition, A. Anand Kumar, PHI.

Reference Books:

Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.

A First Course in Digital System Design: An Integrated Approach, India Edition, John P. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc.

Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.

Digital Design, Robert K. Dueck, CENGAGE Learning.

Digital Principles and Applications, 6th Edition, Donald P. Leach, Albert Paul Malvino and Goutam Saha, Tata McGraw Hill Publishing Company Ltd., New Delhi.

CO - PO Matrix of Course

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C1	3	-	-	-	-	-	-	-	1	-	-	2	-	-	-
C2	3	2	1	-	-	-	-	-	1	-	-	1	-	-	-
C3	3	3	3	2	2	1	-	-	2	1	1	1	-	-	-
C4	3	3	3	3	3	2	1	-	2	2	2	2	1	1	-
C5	3	3	3	3	3	2	2	-	2	2	2	2	1	1	1
C6	3	-	2	2	2	1	1	-	2	1	1	1	1	1	1
Average	3	2.75	2.4	2.5	2.5	1.5	1.33	0	1.67	1.5	1.5	1.5	1	1	1

MICROPROCESSORS AND MICROCONTROLLERS

Subject Code	L	T	P	C	QP
BECPC 4020	**3**	**0**	**0**	**3**	

Pre -Requisite: The students should have good background on digital circuits.

Course Educational Objective

CEO1: To Develop assembly language programs and basic concepts of the microprocessor and microcontroller

CEO2: To provide solid foundation on interfacing the external devices to the microprocessor & microcontroller according to the user requirements in order to create novel products and solutions for the real time problems

CEO3: To Familiar and Design of any type of embedded systems related to industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.

CEO4: To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional carrier in the field embedded systems.

Course Outcome

CO1 Understand the architecture of 8085 ,8086 &8051

CO2 Impart the knowledge about the instruction set

CO3 To use the basic idea about the data transfer schemes and its applications

CO4 Develop skill in simple program writing for 8085 , 8086 and 8051 applications

CO5 To design circuits for various applications using microcontrollers.

CO6 To introduce the need & use of Interrupt structure 8085, 8086 & 8051.

UNIT: 1

Introduction to 8 bit-microprocessor. 10 Hours

Introduction to 8085 microprocessor,Architecture,SignalDescriptions,Buses-Address bus,data bus and control Bus ,Instruction format ,Instruction sets ,addressing Modes,Assembly Language Programming,Timingdiagram,stack and sub routine,Data Transfer Schemes,Memory Interfacing and 8085 interrupts.

UNIT:2

Advanced Microprocessor **12 Hours**

Introduction to 8086 microprocessor, 8086 Architecture, Register Organization, signal descriptions, Memory Segmentation. Physical memory organization. Addressing Modes , instruction Set .Minimum and Maximum mode operation, Bus Cycle of minimum mode and maximum mode. Interrupts of 8086, Memory interfacing & Assembly Language Program.

UNIT:3

Peripheral Devices **10 Hours**

Programmable Peripheral Interface (8255), Programmable Interval Timer (8254)Programmable Interrupt Controller (8259A) - Programmable DMA Controller(8257),Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).

UNIT:4

8051 Microcontroller **12 Hours**

Overview of 8051 microcontroller. Architecture. I/O Ports. Memory organization, Addressing modes, data transfer instructions, Logical instructions, Arithmetic instructions, Branching (Jump & Call) instructions, Bit addressable instructions and special instructions, Interrupts and interrupt handler sub routines (Interrupt Service Routines).Assembly language program.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1 Microprocessor Architecture, Programming and application with 8085,R.S. Gaonkar, PRI Penram International publishing PVT. Ltd., 5thEdition

2. Advanced Microprocessors and Peripherals - A. K. Ray and K.M. Bhurchandani, TMH, 2nd edition 2006.

3. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D.M C Kinlay, Pearson Education, Second Edition, 2008.

Ref. Books

Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096, Krishna Kant, PHI Publication, 2007.

Microprocessors and Interfacing, Programming and Hardware,Douglas V Hall, TMH Publication, 2006.

Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevananthan and S.K. Shah, Oxford University Press.

CO – PO & PSO mapping Matrix of Course Microprocessors And Microcontrollers

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
C1	3	1	3		2	-	1	-	-	-	1	1	1	1	1
C2	2	3	3	2	3	-	-	1	1	-	-	-	1	2	-
C3	1	2	1	3	1	-	1	-	-	-	-	-	2	-	-
C4	1	3	2	1	2	-	-	-	-	-	-	-	-	2	1
C5	2	2	3	2	-	-	-	1	-	-	-	1	-	1	1
C6	1	2	1	3	2	1	-	-	-	1	-	2	-	1	1
Average	1.66	2.16	2.16	2.2	2.0	1	1	1	1	1	1	1.33	1.33	1.4	1

CONTROL SYSTEMS

Subject Code	L	T	P	C	QP
PEI4I102	**3**	**0**	**2**	**4**	

Pre -Requisite:

Course Educational Objective

CEO1:To introduce students to the analysis of circuit networks and control systems.

CEO2: CEO2 CEO2 :To provide the knowledge about stability and compensation considerations, using root locus, the Nichols chart, and Bode plots.

CEO3: To impart the idea of various principles which are usable in building and testing control systems.

Course Outcome

At the end of the course, students will be able to:

CO1 State the basic features, configuration and model of a control system.

CO2 Explain the behavior of different physical systems.

CO3 Apply compensating controllers to stabilize fluctuating factors for various industrial applications.

CO4 Differentiate the time domain & frequency domain behavior of a physical system.

CO5 Propose a specific PID or robust controller for a particular designing task.

CO6 Prepare, evaluate and appraise a control project that performs an engineering application.

UNIT:1 **(11 Hrs)**

INTRODUCTION TO CONTROL SYSTEMS: Basic Concepts of Control Systems, Open loop and closed loop systems, Servo Mechanism/Tracking System, Regulators.

MATHEMATICAL MODELS OF PHYSICAL SYSTEMS: Differential Equations of Physical Systems, Mechanical Translational Systems, Electrical Systems, Analogy between Mechanical and electrical quintiles, Mechanical Accelerometers, Gear Trains.

TRANSFER FUNCTION: Block Diagram Algebra, Signal flow Graphs, Mason's Gain Formula.

FEEDBACK CHARACTERISTICS OF CONTROL SYSTEM: Effect of negative feedback on sensitivity, bandwidth, Disturbance, linearizing effect of feedback, Regenerative feedback.

CONTROL COMPONENTS: AC servomotor, DC servomotor, AC tachometer, Synchro and Stepper motor.

UNIT:2 **(15 Hours)**

TIME RESPONSE ANALYSIS: Standard Test Signals, Time response of first order systems to unit step and unit ramp inputs, Time Response of Second order systems to unit step and unit ramp input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems, Generalized error series and generalized error coefficients.

STABILITY AND ALGEBRAIC CRITERIA: concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion, Application of the Routh stability criterion to linear feedback system, Relative stability by shifting the origin in s-plane.

ROOT LOCUS TECHNIQUE: Root locus concepts, Rules of Construction of Root locus, Determination of Roots from Root locus for a specified open loop gain, Systems with transportation lag, Effect of adding open loop poles and zeros on Root locus.

UNIT: 3 **(8 Hours)**

FREQUENCY RESPONSE ANALYSIS: Frequency domain specifications, , Polar plots, Bode plot. Determination of Gain Margin and Phase Margin from Bode plot.

STABILITY IN FREQUENCY DOMAIN: Principle of argument, Nyquist stability criterion, Application of Nyquist stability criterion for linear feedback system.

UNIT:4 **(6 Hours)**

CLOSED LOOP FREQUENCY RESPONSE: Constant M-circles, Constant N-Circles, Nichol's chart. Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI, PID controllers. Zeigler-Nichols method of tuning PID controllers.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Modern Control Engineering by K. Ogata, 5th edition PHI.

Control Systems Engg. by I.J. Nagrath and M.Gopal, 5th Edition, New Age International Publishers (2010).

Modern Control Systems by Richard C.Dorf and Robert H. Bishop, 11th Ed (2009), Pearson

Reference Books:

Design of Feedback Control Systems by R.T. Stefani, B. Shahian, C.J. Savator, G.H. Hostetter, Fourth Edition (2009), Oxford University Press.

Control Systems (Principles and Design) by M.Gopal 3rd edition (2008), TMH.

Analysis of Linear Control Systems by R.L. Narasimham, I.K. International Publications

Control Systems Engineering by S.P. Eugene Xavier and J. Josheph Cyril Babu, 1st Edition (2004), S. Chand Co. Ltd.

Problems and solutions in Control System Engineering by S.N. Sivanandam and S.N.

Deepa, Jaico Publishing House

CO - PO Matrix of Course

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
C1	2	2	1	-	2	3	3	1	1	1	-	2	3	3	2
C2	2	3	3	2	1	-	1	-	1	3	1	1	2	1	-
C3	3	3	1	2	2	2	2	1	3	2	1	1	1	2	3
C4	3	3	2	3	2	1	-	-	3	1	1	2	3	1	2
C5	3	3	3	3	3	2	1	1	3	2	1	-	2	2	3
C6	3	2	-	1	2	3	1	1	2	3	3	2	-	1	2
Average	2.67	2.67	2	2.2	2	2.2	1.6	1	2.33	2	1.4	1.6	2.2	1.66	2.4

SEMICONDUCTOR DEVICES

Subject Code	L	T	P	C	QP
BECPC 4040	**3**	**1**	**0**	**4**	

Pre -Requisite: The students should have good background knowledge on semiconductor and its properties.

Course Educational Objective

CEO1:To gain basic knowledge on quantum theory of solids and flow mechanism in semiconductor.

CEO2: Provide students the insight for understanding new semiconductor devices and technologies.

CEO3: To provide the students a solid platform on semiconductor devices which can help them to work upon on real field applications like High frequency communications, optical communications etc.

COURSE OUTCOME

CO1 Define the basics of quantum theory of solids and flow mechanism in semiconductor

CO2 Describe the details of semiconductor devices and their working.

CO3 Demonstrate the application of semiconductor devices to various field.

CO4 To compare working threshold of different semiconductor devices.

CO5 Formulate and construct devices with higher performances based upon the requirement.

CO6 To justify the preference of devices based on their advantages and disadvantages for various on field applications.

UNIT: 1 **12 HOURS**

Introduction to the quantum theory of solids: Formation of energy bands, The k-space diagram(two and three dimensional representation), conductors, semiconductors and insulators.

Electrons and Holes in semiconductors: Silicon crystal structure, Donors and acceptors in theband model, electron effective mass, Density of states, Thermal equilibrium, Fermi-Dirac distribution function for electrons and holes, Fermi energy. Equilibrium distribution of electrons & holes: derivation of *n* and *p* from D(E) and f(E), Fermi level and carrier concentrations, The *np* product and the intrinsic carrier concentration. General theory of *n* and *p*, Carrier concentrations at extremely high and low temperatures: complete ionization, partial ionization and freeze-out. Energy-band diagram and Fermi-level, Variation of E_F with doping concentration and temperature.

UNIT:2 **12 HOURS**

Motion and Recombination of Electrons and Holes: Carrier drift: Electron and hole motilities,Mechanism of carrier scattering, Drift current and conductivity. Carrier diffusion: diffusioncurrent, total current density, relation between the energy diagram and potential, electric field. Einstein relationship between diffusion coefficient and mobility. Electron-hole recombination, Thermal generation.

PN Junction: Building blocks of the pn junction theory: Energy band diagram and depletion layer of a pn junction, Built-in potential; Depletion layer model: Field and potential in the depletion layer, depletion-layer width; Reverse-biased PN junction; Capacitance-voltage characteristics; Junction breakdown: peak electric field. Tunneling breakdown and avalanche breakdown; Carrier injection under forward bias-Quasi-equilibrium boundary condition; current continuity equation; Excess carriers in forward-biased pn junction; PN diode I-V characteristic, Charge storage.

UNIT:3 **10 HOURS**

The Bipolar Transistor: Introduction, Modes of operation, Minority Carrier distribution,Collector current, Base current, current gain, Base width Modulation by collector current, Breakdown mechanism, Equivalent Circuit Models - Ebers -Moll Model.

Metal-Semiconductor Junction: Schottky Diodes: Built-in potential, Energy-band diagram, I-Vcharacteristics, Comparison of the Schottky barrier diode and the pn-junction diode. Ohmic contacts: tunneling barrier, specific contact resistance**.**

UNIT:4 **8 HOURS**

MOS Capacitor: The MOS structure, Energy band diagrams, Flat-band condition and flat-bandvoltage, Surface accumulation, surface depletion, Threshold condition and threshold voltage, MOS C-V characteristics, Q_{inv} in MOSFET.

MOS Transistor: Introduction to the MOSFET, Complementary MOS (CMOS) technology, V-ICharacteristics, Surface mobilities and high-mobility FETs, JFET, MOSFET V_t, Body effect and steep retrograde doping, pinch-off voltage,

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

Semiconductor Physics and Devices, 3rd Edition, Donald A. Neamen, Tata McGraw Hill Publishing Company Limited, New Delhi.

Modern Semiconductor Devices for Integrated Circuits, Chenming Calvin Hu, Pearson Education/Prentice Hall, 2009.

Ref. Books

Solid State Electronics Devices, 6th Edition, Ben. G. Stretman and Sanjay Banarjee, Pearson Education, New Delhi.

Physics of Semiconductor Devices, 3rd Edition, S.M. Sze and Kwok K. Ng, Wiley India Pvt. Limited, New Delhi.

CO - PO Matrix of Course

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C1	3	3	1	1	-	-	-	1	2	-	-	1	-	-	1
C2	3	3	3	2	1	1	-	-	1	1	-	2	2	2	-
C3	3	3	3	3	2	1	1	-	-	2	1	1	-	-	2
C4	3	2	2	2	2	1	-	1	-	-	-	2	1	-	-
C5	3	3	3	3	3	-	-	-	-	-	2	-	2	2	-
C6	2	2	1	1	1	-	3	-	1	-	1	-	-	-	2
Average	2.83	2.66	2.16	2.0	1.5	1	2	1	1.33	1.5	1.33	1.5	1.67	2	1.67

Title of the subject

Subject Code		L	T	P	C	QP
BCSPC4030	**Database Management System**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To understand the different issues involved in the design and implementation of a database system

CEO2: To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.

CEO3: To understand and use data manipulation language to query, update, and manage a database

CEO4: To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server(Database Server), Data Warehousing.

CEO5: To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Course Outcome: At the end of the course, the student will be capable of

CO1	Interpreting the Database Management concepts, different Data models and architectures with ER to Relational mapping.
CO2	Applying and executing the SQL, relational algebra and calculus commands to create and manipulate Database.
CO3	Differentiate normal forms for normalization process to construct the consistent Database.
CO4	Design the Database by inspecting concurrency and recovery strategies to make complete DB without confliction and consistent DB in concurrent environment.

UNIT:1 **(15 Hours)**

Introduction to database Systems, advantages of database system over traditional file system, Basic concepts & Definitions, Database users, Database Language, Database System Architecture, Schemas, Sub Schemas, & Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models.

UNIT:2 **(13 Hours)**

Entity relationship model, Components of ER model, Mapping E-R model to Relational schema, Relational Algebra, Tuple & Domain Relational Calculus, Relational Query

Languages: SQL and QBE. Database Design :-Database development life cycle (DDLC), Automated design tools, Functional dependency and Decomposition, Join strategies, Dependency Preservation & lossless Design, Normalization, Normal forms:1NF, 2NF,3NF, and BCNF, Multi-valued Dependencies, 4NF & 5NF. Query processing and optimization: Evaluation of Relational Algebra Expressions, Query optimization, Query cost estimation.

UNIT:3 **(10 Hours)**

Network and Object Oriented Data models, Storage Strategies: Detailed Storage Architecture, Storing Data, Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File & Record Organization, File Organizations & Indexes, Order Indices, B+ Tree Index Files, Hashing Data Dictionary.

UNIT:4 **(12 Hours)**

Transaction processing and concurrency control: Transaction concepts, properties of transaction, concurrency control, locking and Timestamp methods for concurrency control schemes. Database Recovery System, Types of Data Base failure & Types of Database Recovery, Recovery techniques. fundamental concepts on Object-Oriented Database, Object relational database, distributed database, Parallel Database, introduction to Data warehousing & Data Mining.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:1 Sudarshan, Korth: **Database System Concepts**, 6th edition, McGraw-Hill Education

References Books:

1. Elmasari &Navathe: **Fundamentals of Database System**, Pearson Education.

2. Ramakrishnan: **Database Management Systems**, McGraw-Hill Education.

3. Andrew S. Tanenbaum: **Modern Operating Systems**, 3rd Edition, Pearson Education.

4. Terry Dawson, Olaf Kirch: **Linux Network Administrator's Guide**, 3rd Edition O'Reilly Media

DIGITAL ELECTRONICS LABORATORY

Subject Code	L	T	P	C	QP
BECPC4110	**0**	**0**	**2**	**1**	

Pre -Requisite:

Course Outcome

At the end of this course students will be able to demonstrate the ability to

CO1 List the truth tables of all the Logic Gates and their behaviours/Boolean expression.
CO2 Explain all the combinational logic circuits and verification of their truth tables.
CO3 Demonstrate different types of memory elements.
CO4 Differentiate different types of flipflops.
CO5 Simulate the logic circuits using VHDL and Verilog HDL.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
DATABASE MANAGEMENT SYSTEM

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1		1						
CO2	3	3	3	1	3							
CO3	3	2	3		1							
CO4	3	3		3		2						

List of Experiments

(At least 10 experiments should be done, Experiment No. 1 and 2 are compulsory and out of the balance 8 experiments at least 3 experiments has to be implemented through both Verilog/VHDL and hardware implementation as per choice of the student totaling to 6 and the rest 2 can be either through Verilog/VHDL or hardware implementation.)

Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EXNOR, Invert and Buffer Gates, use of Universal NAND/NOR Gate.

Gate-Level Minimization: Two level and multi level implementation of Boolean functions.

Combinational Circuits: Design, assemble and test: adders and subtractors, code converters, gray code to binary and 7 segment displays.

Design, implement and test a given design example with (i) NAND Gates only (ii) NOR Gates only and (iii) using minimum number of Gates.

Design with Multiplexers and De-multiplexers.

Flip-Flop: Assemble, test and investigate operation of SR, D & JK flip-flops.

Shift Registers: Design and investigate the operation of all types of shift registers with parallel load.

Counters: Design, assemble and test various ripple and synchronous counters -decimal counter, Binary counter with parallel load.

Memory Unit: Investigate the behavior of RAM unit and its storage capacity – 16×4 RAM: testing, simulating and memory expansion.

Clock-Pulse Generator: Design, implement and test.

Parallel Adder and Accumulator: Design, implement and test.

Binary Multiplier: Design and implement a circuit that multiplies 4-bit unsigned numbers to produce an 8-bit product.

Verilog/VHDL simulation and implementation of Experiments listed at Sl. No. 3 to 12.

CO - PO Matrix of Course

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C1	3	2	1	-	-	-	-	-	2	-	-	1	-	-	-
C2	3	3	3	2	1	1	1	-	1	1	-	1	-	-	-
C3	3	2	2	3	1	2	-	-	2	1	1	1	1	1	1
C4	3	3	3	3	2	1	1	-	1	1	1	1	-	-	-
C5	3	3	3	3	2	2	1	-	2	1	-	2	2	1	1
Average	3	2.60	2.40	2.75	1.50	1.50	1	-	1.60	1	1	1.20	1.50	1	1

Subject Code	MICROPROCESSOR& MICROCONTROLLER LAB	L	T	P	C	QP
BECPC 4120		0	0	2	1	

Pre-Requisites (If any) – The students should have good background on digital circuits.

Course Educational Objective

CEO-1: Developing of assembly level programs and providing the basics of the processors

CEO-2: To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional carrier

CEO-3: To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems

Course Outcomes

CO1 Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.

CO2 An in depth knowledge of applying the concept of real time application.

CO3 Troubleshoot interactions between software and hardware;

CO4 Analyze abstract problems and apply a combination of hardware and software to address the problem;

CO5 Use standard test and measurement equipment to evaluate digital interfaces.

CO6 Design circuits for various applications using microprocessor & microcontroller.

Write a program for addition of two 8 –bit and 16 bit numbers.

.write a program for addition of series of numbers.

Subtraction of two 8 bit and 16 bit numbers.

Write a program for finding the larger between two numbers.

Write a program to find the smallest from an array of numbers.

Arrange a series of numbers in ascending order.

Multiplication and division of two 8 bit numbers

. Demonstrate the generation of square wave using PPI

Write a program to interface ADC and DAC with 8085.

Write a program to interface stepper motor with 8085.

Write a program to interface traffic light control with 8085.

Teaching Method(s): Marker & Board/ PPT/ Demonstration.

CO – PO– PSO Matrix of Course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C1	3	2	2	2	1	1	-	1	2	2	-	1	1	2	-
C2	2	1	3	1	3	2	2	-	-	-	-	-	1	1	1
C3	1	-	1	3	2	-	1	-	2	1	-	1	-	-	-
C4	1	3	2	2	2	2	-	-	2	-	1	-	1	2	2
C5	2	2	2	2	1	1	-	2	-	2	-	-	1	-	-
C6	2	2	1	3	2	-	-	-	2	-	1	-	2	1	-
Average	1.83	2.4	1.83	2.16	1.83	1.5	1.5	1.5	2	1.67	1	1	1.2	1.5	1.5

Title of the subject

Subject Code		L	T	P	C	QP
PEI3I102	**CONTROL SYSTEM LABORATORY**	**3**	**0**	**2**	**4**	

Pre -Requisite:

Course Educational Objective

CEO1: To highlight the electrical modeling of a second order system and analyse the under-damped, over-damped and critically damped cases.

CEO2: To study the effects of poles and zeros location in the s-plane on the transient and

steady state behavior.

CEO3: To investigate the Servo-Motor speed and position control principles by designing and selecting specific P, I and PIgains for specific responses.

Course Outcome

At the end of the course, students will be able to:

CO1 Recognize analog and digital control skills to evaluate & control engineering problems.

CO2 Demonstrate the analog control experiments using analog computers and digital control experiments using PC & servo trainers.

CO3 Apply Laplace transform, transfer function, modelling RLC circuit and block diagram for simulation & control.

CO4 Analyze various practical sessions in control engineering leading towards a research point.

CO5 Design and determine control system parameters & transfer function by combining both the theoretical and applied analysis.

CO6 Justify the knowledge in the field of control engineering using both analog and digital techniques.

LIST OF EXPERIMENTS:

Control:

To study of speed torque characteristics of two phase ac servomotor and determination of its transfer function.

To obtain the frequency response of a lag and lead compensator.

To observe the time response of a second order process with P, PI and PID

Control and apply PID control to servomotor.

To study and validate the controllers for a temperature control system.

To study the position control system using Synchro.

Simulation:

To Determine the step response and evaluation of time domain specification for a 2nd order system.

To study of P, PI, PD and PID type controller on the step response of a feed back control system using simulink.

To draw the root locus for a given transfer function and verification of breakaway point and imaginary axis crossover point using MATLAB.

To draw the polar, Nyquist and bode plot for a given transfer function using MATLAB.

To design ac and dc electrical circuits using Simulink.

CO - PO Matrix of Course

CO	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
C1	2	2	1	1	1	2	2	1	1	-	1	3	1	-	1
C2	3	3	1	-	1	1	-	-	1	1	1	3	2	2	1
C3	3	3	-	1	3	2	3	1	2	1	2	2	3	2	3
C4	2	2	2	3	1	1	1	-	2	2	1	-	3	3	-
C5	3	2	3	2	3	2	3	2	3	2	2	-	2	3	2
C6	2	2	1	-	1	1	2	2	2	3	3	3	-	1	1
Average	2.5	2.33	1.6	1.75	1.66	1.5	2.2	1.5	1.83	1.8	1.66	2.75	2.2	2.2	1.6

DATABASE MANAGEMENT SYSTEM LAB.

(Sub. Code: BCSPC4130)

Course Educational Objective:

CEO1: Design and create a ERD (Entity Relationship Diagram) using software tool.

CEO2: Learn how to design and create and use a relational database system.

Course outcomes

CO1: Construct an Entity-Relationship (E-R) model (diagram) from specifications and to transform to relational model.

CO2: Create a relational database with different types of integrity constraints.

CO3: Perform Create, Retrieve, Update, Delete SQL operations on relational database.

CO4: Create and submit a simple database application that demonstrates understanding of all the above, working as a team.

1. Use of SQL syntax: insertion, deletion, join, updation using SQL.

2. Programs on join statements and SQL queries including where clause.

3. Programs on procedures and functions.

4. Programs on database triggers.

5. Programs on packages.

6. Programs on data recovery using check point technique.

7. Concurrency control problem using lock operations.

8. Programs on ODBC using either VC++.

9. Programs on JDBC.

10. Programs on embedded SQL using C / C++ as host language.

Additional Assignments

1. Use of NoSQL database like MongoDB.

2. Programs on connectivity to MongoDB using MEAN.

3. Programs on connectivity to Mongo-DB using Python.

4. Programs on connectivity to Mongo DB using PHP.

MAPPING OF COURSE OUTCOMES (COS) WITH PROGRAM OUTCOMES (POS)
DATABASE MANAGEMENT SYSTEM LAB

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		2							
CO2	3	3	3	2	2							
CO3	3	3	3									
CO4	3	3	3	2	2				3	2		