VINAYAKA MISSION'S RESEARCH FOUNDATION, SALEM
(Deemed to be University)

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, CHENNAI
&
VINAYAKA MISSION'S KIRUPANANDA VARIYAR ENGINEERING COLLEGE, SALEM

FACULTY OF ENGINEERING AND TECHNOLOGY

STRUCTURED CHOICE BASED CREDIT SYSTEM

BOARD : ELECTRONICS AND COMMUNICATION ENGINEERING
REGULATION : 2017
PROGRAM : B.Tech – BIOMEDICAL ENGINEERING (FULL TIME - REGULAR)

CURRICULUM AND SYLLABUS

SEMESTER – II								
S.NO	**COURSE CODE**	**COURSE TITLE**	**OFFERING DEPARTMENT**	**CATEGORY**	**L**	**T**	**P**	**C**
THEORY								
1		DIFFERENTIAL EQUATIONS AND TRANSFORMS	MATHEMATICS	FC(BS)	2	2	0	**3**
2		PROGRAMMING IN PYTHON	CSE	FC(ES)	3	0	0	**3**
3		SEMICONDUCTOR DEVICES	ECE	CC	3	0	0	**3**
4		SMART MATERIALS	PHYSICS	FC(BS)	3	0	0	**3**
5		ESSENTIALS OF BIOCHEMISTRY	BTE	CC	3	0	0	**3**
PRACTICAL								
6		PROGRAMMING IN PYTHON LAB	CSE	FC(ES)	0	0	4	**2**
8		SEMICONDUCTOR DEVICES LAB	ECE	CC	0	0	4	**2**
		BIOCHEMISTRY LAB	BTE	CC	0	0	4	**2**
TOTAL					**14**	**2**	**12**	**21**
L – LECTURE HOUR T – TUTORIAL HOUR P – PRACTICAL HOUR C – CREDIT								

HSS	HUMANITIES AND SOCIAL SCIENCES	CC	CORE COURSES
BS	BASIC SCIENCES	EC	ELECTIVE COURSES
ES	ENGINEERING SCIENCES	EEC	EMPLOYABILITY ENHANCEMENT COURSES + EXTRA CURRICULAR COURSES + CO - CURRICULAR COURSES
PII	PROJECT + INTERNSHIP + INDUSTRY ELECTIVES		

COURSE CODE	SEMESTER - II				
	NAME OF THE COURSE : **DIFFERENTIAL EQUATIONS AND TRANSFORMS**	**L**	**T**	**P**	**C**
	TOTAL HOURS: **60**	**2**	**2**	**0**	**3**
	PREREQUISITE : **ENGINEERING MATHEMATICS**				

PURPOSE:

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES :

1.	To familiarize with the applications of differential equations.
2.	To equip themselves familiar with Laplace transform
3.	To gain good knowledge in the application of Fourier transform
4.	To learn about Z- transforms and its applications
5.	Fourier series has the wide application in the field of heat diffusion, wave propagation and in signal and systems analysis.

UNIT – I	**ORDINARY DIFFERENTIAL EQUATIONS**	**12**

Solutions of second and third order linear ordinary differential equation with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT – II	**LAPLACE TRANSFORMS**	**12**

Laplace transform – transform of elementary functions – basic properties – derivatives and integrals of transforms – transforms of derivatives and integrals – initial and final value theorems – Transform of periodic functions-Inverse Laplace transform – Convolution theorem – -Solution of linear ODE of second order with constant coefficients

UNIT – III	**FOURIER SERIES**	**12**

Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity - Harmonic Analysis.

UNIT – IV	**FOURIER TRANSFORMS**	**12**

Fourier transform pairs - Fourier Sine and Cosine transforms – Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

UNIT – V	**Z – TRANSFORMS**	**12**

Z-Transform – Elementary Properties – Inverse Z-Transform – Convolution Theorem – Formation of Difference Equations – Solution of first and second order Difference Equations using Z-Transform.

TEXT BOOKS:

1. "Engineering mathematics I & II", Department of Mathematics, VMKVEC (Salem) & AVIT (Chennai), (2012).
2. Dr.A.Singaravelu, "Engineering Mathematics I & II", 23rd Edition, Meenakshi Agency, Chennai (2016).

REFERENCES:

1. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., New Delhi (2011).
2. Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi (2012).
3. Kreyszig, E., "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore (2012).
4. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics", Volumes I & II (10th edition), S. Chand & Co., New Delhi (2014).

COURSE CODE :
NAME OF THE COURSE : DIFFERENTIAL EQUATIONS AND TRANSFORMS

COURSE DESIGNED BY		**DEPARTMENT OF MATHEMATICS**										
1	Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
		√				√						
2	Mapping of instructional objectives with student outcome	1,2				3,4, 5						
3	Category	HSS	BS	ES	CC	EC	EEC	PII				
			√									

COURSE CODE	SEMESTER – II				
	NAME OF THE COURSE : **PROGRAMMING IN PYTHON**	**L**	**T**	**P**	**C**
	TOTAL HOURS : **45**	**3**	**0**	**0**	**3**
	PREREQUISITE : **NIL**				

PURPOSE:

The purpose of this course is to introduce Python, a remarkably powerful dynamic programming language, to write code for different operating systems along with application domain. Python has evolved on more popular and powerful open source programming tool.

INSTRUCTIONAL OBJECTIVES:

1.	Able to setup Python working environment.
2.	To understand the object oriented features of Python.
3.	To develop Network Applications using Python.
4.	To develop Web Applications using Python.
5.	To use and develop GUI applications in Python programming.

UNIT – I	**INTRODUCTION**	**9**

Introduction to Python – Advantages of Python programming – Tokens – Keywords - Variables – I/O methods - Data types – Operators.

UNIT – II	**DATA STRUCTURES**	**9**

Strings - List - Tuples - Dictionaries – Sets.

UNIT – III	**CONTROL STATEMENTS**	**9**

Flow Control – Selection Control Structure – If – if-else – if-elif-else – nested if Iterative control structures: while loop, for loop and range.

UNIT – IV	**FUNCTIONS**	**9**

Declaration – Types of arguments – Fixed arguments, default arguments, keyword arguments, variable arguments, and keyword variable arguments – Recursion – Anonymous functions: lambda - Generators – Decorators.

UNIT – V	**EXCEPTION HANDLING**	**9**

Exception Handling - Regular Expression - Calendars and Clocks Files: File I/O operations – Directory Operations– Reading and Writing in Structured Files: CSV and JSON.

TEXT BOOK:

1. Bill Lubanovic, "Introducing Python Modern Computing in Simple Packages", 1st Edition, O'Reilly Media, 2014.

REFERENCES:

1. Mark Lutz, “Learning Python”, 5th Edition, O'Reilly Media, 2013.
2. David Beazley, Brian K. Jones, "Python Cookbook", 3rd Edition, O'Reilly Media, 2013.
3. Mark Lutz, “Python Pocket Reference”, 5th Edition, O'Reilly Media, 2014.
4. www.python.org.
5. www.diveintopython3.net.

COURSE CODE : **NAME OF THE COURSE : PROGRAMMING IN PYTHON**												
COURSE DESIGNED BY		**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**										
1	Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
		√				√						√
2	Mapping of instructional objectives with student outcome	1-5				1-5						1-5
3	Category	HSS	BS	ES	CC	EC	EEC	PII				
				√								

COURSE CODE	SEMESTER – II				
	NAME OF THE COURSE : **SEMICONDUCTOR DEVICES**	**L**	**T**	**P**	**C**
	TOTAL CONTACT HOURS: **45**	**3**	**0**	**0**	**3**
	PREREQUISITE : **NIL**				

PURPOSE:

This is an introduction course to Semiconductor Devices. The course begins with a discussion on how electron energy bands are formed in semiconductors; followed by discussions on equilibrium statistics of electrons and holes, drift, diffusion currents, generation and recombination processes. It then examines the principles and operations of essential semiconductor devices used in today's electronics: diodes, light detectors and emitters, bipolar junction transistors and MOSFETs.

INSTRUCTIONAL OBJECTIVES:

1.	Introduce students to the physics of semiconductors and the inner working of semiconductor devices.
2.	Provide students the insight useful for understanding new semiconductor devices and technologies.
3.	Understand their capabilities and limitations and make decisions regarding their best utilization in a specific situation.
4.	Understand the nature and scope of modern electronics.
5.	Understand their capabilities and limitations and make decisions regarding their best utilization in special devices.

UNIT – I	**SEMICONDUCTOR DIODES AND APPLICATIONS**	**9**

Introduction, Semiconductor Materials - Ge, Si, and GaAs, Covalent Bonding and Intrinsic Materials, Energy Levels, n-Type and p-Type Materials, Semiconductor Diode, Resistance Levels, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Reverse Recovery Time, Diode Specification Sheets, Semiconductor Diode Notation, Diode Testing, Zener Diodes, Light-Emitting Diodes, Sinusoidal Inputs; Half-Wave Rectifier, Full-Wave Rectifier, Clipper, Clamper, Zener Diode, Voltage-Multiplier Circuits, Practical Applications

UNIT – II	**BIPOLAR JUNCTION TRANSISTORS**	**9**

Introduction, Transistor Construction, Transistor Operation, Common-Base Configuration, Common-Emitter Configuration, Common-Collector Configuration, Limits of Operation, Transistor Specification Sheet, Transistor Testing, Transistor Casing and Terminal Identification.

UNIT – III	**FIELDEFFECT TRANSISTORS**	**9**

Introduction, Construction and Characteristics of JFETs, Transfer Characteristics, Important Relationships, Depletion-Type MOSFET, Enhancement-Type MOSFET, MOSFET Handling.

UNIT – IV	**VOLTAGE REGULATORS**	**9**

Introduction, General Filter Considerations, Capacitor Filter, RC Filter, Discrete Transistor Voltage Regulation, IC Voltage Regulators.

UNIT – V	**SPECIAL PURPOSE DEVICES**	**9**

Introduction, Silicon-Controlled Rectifier, Basic Silicon-Controlled Rectifier Operation, SCR Characteristics and Applications, Shockley Diode, Diac, Triac, Unijunction Transistor, Phototransistors, MISFETs, MESFETs, TFETs, HEMTs, Silicon Nano Wire Transistor.

TEXT BOOK:
1.Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 11th Edition, 2013.
REFERENCES:
1. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electron Devices and Circuits", Tata McGraw Hill, 2010. 2. David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford Press, 2009. 3. B L Theraja, R S Sedha, "Principles of Electronic Devices and Circuits", S.Chand, 2004.

COURSE CODE : **NAME OF THE COURSE : SEMICONDUCTOR DEVICES**												
COURSE DESIGNED BY		**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**										
1	Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
		√	√	√								
2	Mapping of instructional objectives with student outcome	1,5	4	2,3								
3	Category	HSS	BS	ES	CC	EC	EEC	PII				
					√							

COURSE CODE	SEMESTER – II				
	NAME OF THE COURSE : **SMART MATERIALS**	**L**	**T**	**P**	**C**
	TOTAL HOURS : **45**	**3**	**0**	**0**	**3**
	PREREQUISITE : **PHYSICAL SCIENCES**				

PURPOSE:

The fundamental knowledge gained will be useful for various applications in Engineering & Technology.

INSTRUCTIONAL OBJECTIVES:

1.	To understand the properties of smart materials.
2.	To understand the structure of crystalline materials.
3.	To learn the synthesis of Nano materials.
4.	To learn the properties and classification of magnetic materials.
5.	To understand the concept of superconducting materials and their properties.

UNIT – I	**SMART MATERIALS**	**9**

Shape Memory Alloys (SMA) – Characteristics and properties of SMA, Application, advantages and disadvantages of SMA. Metallic glasses – Preparation, properties and applications.

UNIT – II	**CRYSTALLINE MATERIALS**	**9**

Unit cell – Bravais lattice – Miller indices – Calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC, HCP structures.

UNIT – III	**NANO MATERIALS**	**9**

Nanophase materials – Top-down approach - Mechanical Grinding – Lithography – Bottom-up approach – Sol-gel method – Carbon nanotubes – Fabrication – applications.

UNIT – IV	**MAGNETIC MATERIALS**	**9**

Basic concepts – Classification of magnetic materials – Domain theory – Hysteresis – Soft and Hard magnetic materials.

UNIT – V	**SUPERCONDUCTING MATERIALS**	**9**

Superconducting phenomena – properties of superconductors – Meissner effect – isotope effect – Type I and Type II superconductors – High T_c Superconductors – Applications of superconductors.

TEXT BOOK:

1. Mani P, “Engineering Physics II”, Dhanam Publications, 2011.

REFERENCES:

1. Pillai S.O., “Solid State Physics”, New Age International (P) Ltd., publishers, 2009.
2. Senthilkumar G., “Engineering Physics II”, VRB Publishers, 2011.

COURSE CODE : **NAME OF THE COURSE : SMART MATERIALS**												
COURSE DESIGNED BY		**DEPARTMENT OF PHYSICS**										
1	Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
		√	√	√	√	√		√	√	√	√	√
2	Mapping of instructional objectives with student outcome	3	1	1	3	5		2	4	3	5	1
3	Category	HSS	BS	ES	CC	EC	EEC	PII				
			√									

COURSE CODE	SEMESTER – II				
	NAME OF THE COURSE : **ESSENTIALS OF BIOCHEMISTRY**	**L**	**T**	**P**	**C**
	TOTAL HOURS : **45**	**3**	**0**	**0**	**3**
	PREREQUISITE : **NIL**				

PURPOSE:

To provide the students a sound but crisp knowledge on the biochemical basis of life processes and biotechnology.

INSTRUCTIONAL OBJECTIVES:

1.	To understand the basic structure and properties of Biomolecules.
2.	To emphasize the role of biomolecules by providing basic information on specific metabolic diseases and disorders.

UNIT – I	**CARBOHYDRATES**	**9**

Biological importance, Classification and Properties of Monosaccharides, Disaccharides and Polysaccharides (Starch, Glycogen, Cellulose and their derivatives, Chitin, Peptidoglycans, Glycoaminoglycans, Glycoconjugates).

UNIT – II	**LIPIDS**	**9**

Biological importance, Classification. Fattyacids: classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids, Triacylglycerols: nomenclature, physical properties, chemical properties. Glycerophospholipids (lecithins, cephalins, phosphatidyl serine, phosphatidyl inositol, sphingomyelins).

UNIT – III	**AMINO ACIDS AND PROTEINS**	**9**

Amino acids – Classification, Structure, Properties and Biological importance. Proteins – Classification, Structural organization of Proteins – Primary, Secondary (α-helix, β-pleated structure, triple helix), Tertiary and Quaternary (Myoglobin and Hemoglobin), Factors stabilizing, Properties and Biological importance, Denaturation and Renaturation.

UNIT – IV	**NUCLEIC ACIDS**	**9**

Nucleosides and nucleotides, configuration and conformation, Composition of RNA and DNA, Physico-chemical properties of nucleic acids – effect of alkali, acid and heat (denaturation and renaturation), features of phosphodiester bond, endonucleases. Complementary base pairing, secondary structure of RNA, features of DNA double helix (Watson-Crick model), Nucleoproteins – histone and nonhistone.

UNIT – V	**VITAMINS AND MINERALS**	**9**

Nutritional importance of vitamin, classification, source, daily requirements and functions, Deficiency symptoms – hypervitaminosis of fat soluble vitamins. Nutritional importance of Minerals – classification, source, daily requirement and deficiency symptoms.

TEXT BOOK:

1. "Fundamentals of Biochemistry", Jain J.L., Sunjay Jain and Nitin Jain., S.Chand & Company Ltd., 6th Edition, 2005.

REFERENCES:

1. "Text Book of Biochemistry for Medical Students", Ambika Shanmugham, Lippin cott Williams & Wilkins, 7th Edition, 2012.
2. "Biochemistry", Rastogi S.C. Mc. Graw-Hill Publishing Company Ltd, 6th Edition, 2007.
3. "Principles of Biochemistry", David L. Nelson and Michael M. Cox, W. H. Freeman and Company, 4th Edition, 2005.
4. "Text book of Biochemistry", Sathyanarayana U and Chakrapani U., Uppala Author Publishers Interlinks, 3rd Edition, 2006.

COURSE CODE :
NAME OF THE COURSE : ESSENTIALS OF BIOCHEMISTRY

COURSE DESIGNED BY		**DEPARTMENT OF BIOTECHNOLOGY**										
1	Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
			√	√	√			√	√	√		
2	Mapping of instructional objectives with student outcome		1	2	2			1,2	2	2		
3	Category	HSS	BS	ES	CC	EC	EEC	PII				
					√							

COURSE CODE	SEMESTER – II				
	NAME OF THE COURSE : **PROGRAMMING IN PYTHON LAB**	**L**	**T**	**P**	**C**
	TOTAL HOURS : **60**	**0**	**0**	**4**	**2**
	PREREQUISITE : **NIL**				

PURPOSE:

This course will help the students to gain the in-depth knowledge in Python Programming.

INSTRUCTIONAL OBJECTIVES:

1.	To understand Control Structures.
2.	To understand Concept of Arrays.
3.	To implement Functions and files.

LIST OF EXPERIMENTS:

1. Write a Program to sum the series of N numbers.
2. Write a Program to calculate Simple Interest.
3. Write a Program to generate Fibonacci Series using for loop.
4. Write a program to calculate factorial using while loop.
5. Write a Program to
   a) Find the greatest of three numbers using if condition.
   b) Find the greatest of three numbers using conditional operator.
6. Write a program for finding the roots of a given quadratic equation using conditional control statements.
7. Write a program to compute matrix multiplication using the concept of arrays.
8. Write a program to compute matrix multiplication using the concept of arrays.
9. Write a program to implement recursive function.
10. Write a program to read and write data using file concepts.

REFERENCE:

1. Laboratory reference manual.

COURSE CODE :
NAME OF THE COURSE: PROGRAMMING IN PYTHON LAB

COURSE DESIGNED BY		**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**										
1	Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
		√				√						√
2	Mapping of instructional objectives with student outcome	1-5				1-5						1-5
3	Category	HSS	BS	ES	CC	EC	EEC	PII				
				√								

COURSE CODE	SEMESTER - II				
	NAME OF THE COURSE : **SEMICONDUCTOR DEVICES LAB**	**L**	**T**	**P**	**C**
	TOTAL HOURS: **60**	**0**	**0**	**4**	**2**
	PREREQUISITE: **NIL**				

PURPOSE:

To reinforce learning in the accompanying semiconductor devices course through hands-on experience by examining the electrical characteristics of various semiconductor devices, such as diodes, BJTs and FETs. To provide the student with the capability for performing various analysis of semiconductor devices.

INSTRUCTIONAL OBJECTIVES :

1.	Emphasizes the practical, hands-on component of this course.
2.	It complements the theoretical material presented in lecture, and as such, is integral and indispensible to the mastery of the subject.
3.	To study experimentally the characteristics of diodes, BJT's and FET's.
4.	To verify practically the response of various special purpose electron devices.
5.	To provide students engineering skills by way of breadboard circuit design with electronic devices and components.

LIST OF EXPERIMENTS:

1. Half Wave Rectifier
2. Full Wave Rectifier
3. Clipper
4. Clamper
5. Input/output Characteristics of CE Amplifier
6. Input/output Characteristics of CC Amplifier
7. Transfer Characteristics of JFET
8. Voltage Regulator
9. TRIAC, DIAC
10. SCR

COURSE CODE :
NAME OF THE COURSE : SEMICONDUCTOR DEVICES LAB

COURSE DESIGNED BY		**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**										
1	Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
			√	√								
2	Mapping of instructional objectives with student outcome		1,2,3	4,5								
3	Category	HSS	BS	ES	CC	EC	EEC	PII				
					√							

COURSE CODE	SEMESTER – II				
	NAME OF THE COURSE: **BIOCHEMISTRY LAB**	**L**	**T**	**P**	**C**
	TOTAL HOURS: **60**	**0**	**0**	**4**	**2**
	PREREQUISITE: **ESSENTIALS OF BIOCHEMISTRY**				

PURPOSE:

To develop the skills of the students by providing hands on training in various techniques in Biochemistry.

INSTRUCTIONAL OBJECTIVES:

At the end of the course, the students would have developed their skills in

1.	Laboratory safety and standard operating procedures of common laboratory equipment's.
2.	To impart skills in preparation of solutions and biological buffers.
3.	To extend knowledge in analysis & estimation of biomolecules.

LIST OF EXPERIMENTS:

1. pH measurements and Buffer preparations.

TITRIMETRIC EXPERIMENTS

2. Estimation of Ascorbic acid by Titrimetric method using 2, 6 Dichloro phenol indophenols.
3. Determination of Saponification value of Edible oil
4. Determination of Acid number of Edible oil.
5. Determination of Iodine value of Oil.

BIOCHEMICAL PREPARATIONS

6. Isolation of Chloroplast from Spinach leaves.
7. Cheese Production from Milk.
8. Casein from Milk.
9. Starch from Potato.

REFERENCE:

1. Laboratory Manual

COURSE CODE :
NAME OF THE COURSE : BIOCHEMISTRY LAB

COURSE DESIGNED BY		**DEPARTMENT OF BIOTECHNOLOGY**										
1	Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
		√	√	√	√	√					√	√
2	Mapping of instructional objectives with student outcome	1	2	3	3	3					1	2
3	Category	HSS	BS	ES	CC	EC	EEC	PII				
					√							

CATEGORY :			
HSS	HUMANITIES AND SOCIAL SCIENCES	CC	CORE COURSES
BS	BASIC SCIENCES	EC	ELECTIVE COURSES
ES	ENGINEERING SCIENCES	EEC	EMPLOYABILITY ENHANCEMENT COURSES + EXTRA CURRICULAR COURSES + CO - CURRICULAR COURSES
PII	PROJECT + INTERNSHIP + INDUSTRY ELECTIVES		

STUDENT OUTCOMES :	
a.	An ability to apply knowledge of Mathematics, Science and Engineering.
b.	An ability to design and conduct experiments, as well as to analyze and interpret data.
c.	An ability to design a system, component, or process to meet desired needs within realistic constraints such as Economic, Environmental, Social, Political, Ethical, Health and Safety, Manaufaturability and Sustainability.
d.	An ability to function on Multi Disciplinary Teams.
e.	An ability to identify, formulate and solve Engineering Probems.
f.	An understanding of professional and Ethical Responsibility.
g.	An ability to Communicate Effectiely.
h.	The broad education necessary to understand the impact of Engineering Solutions in Global, Economic, Environmental and Social Context.
i.	A recognition of the need for, and an ability to engage in Life-Long Learning.
j.	A knowledge of contemporary issues.
k.	An ability to use the Techniques, Skills and Modern Engineering Tools necessary for Engineering Practice.