CURRICULUM AND DETAILED SYLLABI

FOR

B.E DEGREE (Computer Science and Engineering) PROGRAMME

SECOND SEMESTER

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2018 - 2019 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001-2008 certified
Autonomous Institution affiliated to Anna University)

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E Degree (Computer Science and Engineering) Programme
COURSES OF STUDY
(For the candidates admitted from 2018 -19 onwards)

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
18MA210	Matrices and Ordinary Differential Equations	BS	3	-	-	3
18CS220	Problem Solving using Computers	ES	3	-	-	3
18CS230	Digital Circuits	PC	3	-	-	3
18CS240	Computer Organization and Architecture	PC	3	-	-	3
THEORY CUM PRACTICAL						
18CS260	Computer Programming	PC	2	-	2	3
PRACTICAL						
18CS270	Digital Circuits Lab	PC	-	-	2	1
18CS280	Workshop	ES	-	-	2	1
18ES290	Lateral Thinking	ES	-	-	2	1
MANDATORY AUDIT COURSE						
18CHAA0	Environmental Science	AC	1	-	1	-
Total			**15**	**-**	**9**	**18**

AC : Audit Course
BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core

L : Lecture
T : Tutorial
P : Practical

Note:

1 Hour Lecture is equivalent to 1 credit

1 Hour Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E Degree (Computer Science and Engineering) Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2018-19 onwards)

SECOND SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment	Terminal Exam *	Max. Marks	Terminal Exam	Total
THEORY								
1	18MA210	Matrices and Ordinary Differential Equations	3	50	50	100	25	50
2	18CS220	Problem Solving using Computers	3	50	50	100	25	50
3	18CS230	Digital Circuits	3	50	50	100	25	50
4	18CS240	Computer Organization and Architecture	3	50	50	100	25	50
THEORY CUM PRACTICAL								
5	18CS260	Computer Programming	3	50	50	100	25	50
PRACTICAL								
6	18CS270	Digital Circuits Lab	3	50	50	100	25	50
7	18CS280	Workshop	-	100	-	100	-	50
8	18ES290	Lateral Thinking	-	50	50	100	25	50
MANDATORY AUDIT COURSE								
9	18CHAA0	Environmental Science	-	50	50	100	25	50

* Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

18MA210	MATRICES AND ORDINARY DIFFERENTIAL EQUATIONS

Category	L	T	P	Credit
BS	3	0	0	3

Preamble

In engineering, particularly Solid Mechanics, Aerodynamics, Fluid Flow, Heat Flow and Robotics have application that requires an understanding of Vector Calculus and Differential Equations. Also Mathematical tool Laplace Transforms is very much essential to solve ordinary differential equations that occur in the above areas. Eigen values and Eigenvectors are extremely important while creating engineering models in control systems, designing bridges, communication systems and searching algorithms. The course is designed to impart the knowledge and understanding of the above concepts to all Engineers and apply them in their areas of specialization.

Prerequisite

18MA110 Engineering Calculus

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Compute the Laplace transform and inverse Laplace transform of different functions	10%
CO2	Solve the given initial value problem using Laplace transform	15%
CO3	Apply matrix algebra techniques for transformations of conic sections into principle axes	25%
CO4	Solve the model developed for the given system using ordinary differential equation	25%
CO5	Compute divergence and curl of vector functions	10%
CO6	Apply the concepts of vector differentiation and vector integration to fluid flow and heat transfer problems	15%

CO Mapping with CDIO Curriculum Framework

CO	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components
		Cognitive	Affective	Psychomotor	
CO1	TPS2	K2	A2	-	1.1
CO2	TPS3	K3	A3	-	1.1
CO3	TPS3	K3	A3	-	1.1
CO4	TPS3	K3	A3	-	1.1
CO5	TPS2	K2	A2	-	1.1
CO6	TPS3	K3	A3	-	1.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M			-	-	-	-		-	-	
CO2.	S	S	S		-	-	-	-	M	-	-	M
CO3.	S	S		S	-	-	-	-		-	-	S

CO4.	S	S	S	S	-	-	-	-	M	-	-	M
CO5.	S	M										
CO6.	S	S	S									

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	10	10	10				10
Understand	30	30	30				20
Apply	60	60	60	100	100	100	70
Analyse	00	00	00				00
Evaluate	00	00	00				00
Create	00	00	00				00

Sample Questions for Course Outcome Assessment**

Course Outcome 1

1. Show that Laplace transform of $\frac{1}{\sqrt{t}}$ is $\frac{\sqrt{\pi}}{s}$.
2. Identify the inverse Laplace transform of $\log\left(\frac{s^2+1}{(s-1)^2}\right)$.
3. Discuss any three properties of Laplace transforms.

Course Outcome 2

1. Apply Laplace transform solve $y''+9y=\delta\left(t-\frac{\pi}{2}\right)$, $y(0)=2,\ y'(0)=0$.
2. By using Laplace transform, solve $x''(t)+3x'(t)+2x(t)=2(t^2+t+1)$; with $x(0)=2, x'(0)=0$.
3. Apply convolution theorem, Solve the Voltera integral equation of the second kind $y(t)-\int_0^t y(\tau)\sin(t-\tau)d\tau=t$.

Course Outcome 3

1. An elastic membrane in the $x_1\ x_2$ plane with boundary circle ${x_1}^2+{x_2}^2=1$ is stretched so that a point $P;(x_1,x_2)$ goes over into the point $Q;(y_1,y_2)$ given by $y_1=5x_1+3x_2$, $y_2=3x_1+5x_2$

   Find the principal directions that is the directions of the position vector X of P for which the direction of the position vector Y of Q is the same or exactly opposite. Predict the boundary circle take under this deformation?
2. Discover the type of conic section the following quadratic form represents and transform it to principal axes: $Q=17{x_1}^2-30x_1x_2+17{x_2}^2=128$.

3. Diagonalize the matrix $\begin{bmatrix} 6 & 0 & 0 \\ 12 & 2 & 0 \\ 21 & -6 & 9 \end{bmatrix}$

Course Outcome 4

1. Reduce to first order and solve $y''-y'=0$
2. Compute the general solution for $y''+y'+(\pi^2+1/4)y = e^{-x/2}\sin \pi x$
3. Solve $(x^2D^2-4xD-6)y=c$

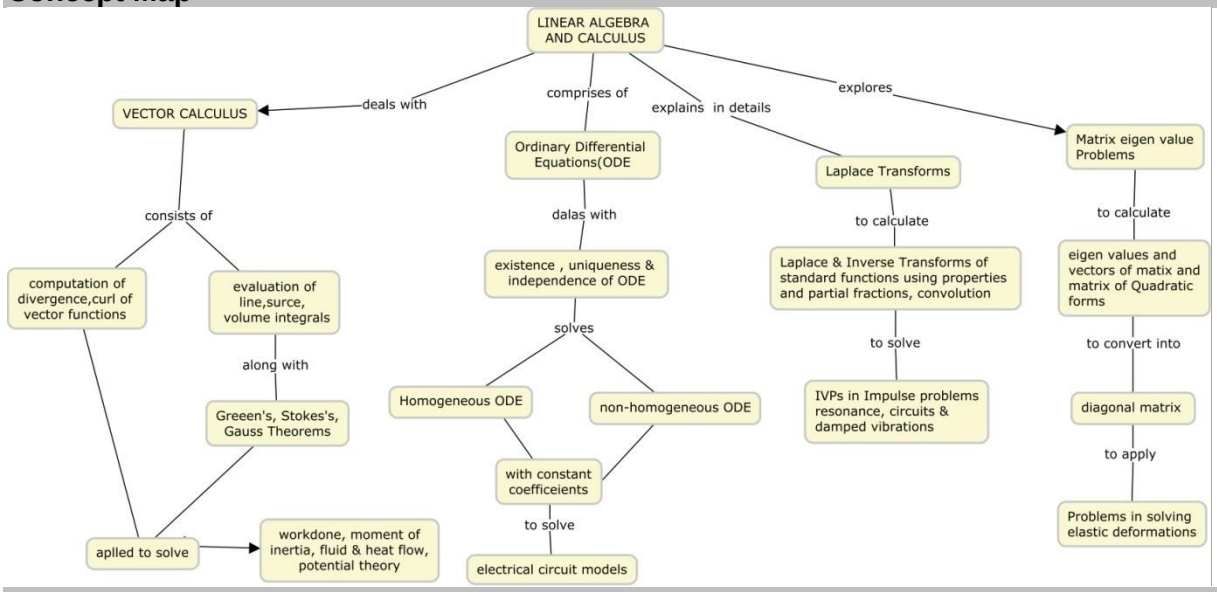
Course Outcome 5

1. Predict the value of $div(curl\vec{F})$.
2. If ϕ_1 and ϕ_2 are scalar point functions and $\vec{F}$ is a vector point function such that $\phi_1\vec{F}=\nabla\phi_2$ then identify $\vec{F}.curl\,\vec{F}$.
3. Estimate $curl\,\vec{v}$, where $\vec{v}=\left[e^{-z^2},e^{-x^2},e^{-y^2}\right]$.

Course Outcome 6

1. Predict the work done by the force $\vec{F}=[y^2,-x^2]$ acting on a particle in $y=4x^2$ from (0,0) to (1,4).
2. Compute the amount of fluid that crosses the surface in a flow per unit time at any one instant, if the velocity field is $\vec{v}=y\vec{\imath}+x\vec{j}+z\vec{k}$ over the boundary of the region enclosed by the paraboloid z = 1- x^2 - y^2 and the plane z = 0.
3. Apply Stokes theorem to compute $\int_C \vec{F}.\vec{r}'ds$ where $\vec{F}=[y,xz^3,-zy^3]$ and C is circle $x^2+y^2=4, z=-3$.

Concept Map



Syllabus

LAPLACE TRANSFROMS: Laplace transform, Linearity, First Shifting theorem – Transforms of derivatives and integrals, ODEs – Unit step function, Second shifting theorem – Short

Impulses, Dirac's delta function, partial fractions – Convolution, Integral Equations – Differentiation and integration of transforms. **MATRIX EIGEN VALUE PROBLEM:** The Matrix Eigen value Problem, Determining Eigenvalues and Eigenvectors – Some Applications of Eigen value Problems – Symmetric, Skew symmetric and orthogonal matrices – Eigen bases, Diagonalization, Quadratic forms. **ORDINARY DIFFERENTIAL EQUATION:** Homogeneous Linear ODEs of second order – Homogeneous Linear ODEs with constant coefficients – Euler Cauchy Equation – Existence and uniqueness of solutions, Wronskian - Nonhomogeneous ODE – Modelling: Electric Circuits- Solution by Variation of Parameters. **VECTOR CALCULUS:** Divergence of a Vector Field- Curl of a Vector Field- Line Integrals- Path independence of line integrals- Green's Theorem in the plane- Surface Integrals- Triple Integrals, Divergence Theorem of Gauss- Applications of the Divergence Theorem- Stoke's Theorem.

Learning Resources

1. Erwin Kreszig, "Advanced Engineering Mathematics",10th edition, Wiley, 2017.
   a. Laplace transforms : [sections 6.1,6.2,6.3,6.4,6.5,6.6]
   b. Matrix eigen value problem : [sections 8.1,8.2,8.3,8.4]
   c. Ordinary differential equations : [sections 2.1,2.2,2.5,2.6,2.7,2.9,2.10]
   d. Vector calculus : [sections 9.8.9.9,10.1,10.2,10.4,10.6, 10.7,10.8,10.9]
2. Peter V.O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2017.
3. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2016.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
5. Made Easy Team, Engineering Mathematics, Made Easy Publications, 2018.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**LAPLACE TRANSFORMS**		
1.1	Laplace Transform. Linearity. First Shifting Theorem (*s*-Shifting)	2	CO1
1.2	Transforms of Derivatives and Integrals. ODEs	2	CO2
1.3	Unit Step Function (Heaviside Function). Second Shifting Theorem (*t*-Shifting)	1	CO1
1.4	Short Impulses. Dirac's Delta Function. Partial Fractions	1	CO1
1.5	Convolution. Integral Equations	2	CO2
1.6	Differentiation and integration of transforms	1	CO1
2	**MATRICES EIGEN VALUE PROBLEMS**		
2.1	Determining Eigenvalues and Eigenvectors	2	CO3
2.2	Some Applications of Eigenvalue Problems	1	CO3
2.3	Symmetric, Skew-Symmetric, and Orthogonal Matrices	2	CO3
2.4	Eigenbases. Diagonalization.	2	CO3
2.5	Quadratic Forms	2	CO3
3	**ORDINARY DIFFERENTIAL EQUATION**		
3.1	Homogeneous Linear ODEs of Second Order	2	CO4
3.2	Homogeneous Linear ODEs with Constant Coefficients	1	CO4
3.3	Euler–Cauchy Equations	1	CO4
3.4	Existence and Uniqueness of Solutions. Wronskian	1	CO4

3.5	Nonhomogeneous ODEs	2	CO4
3.6	Solution by Variation of Parameters	2	CO4
4	**VECTOR CALCULUS**		
4.1	Divergence and Curl of a Vector Field	2	CO5
4.2	Line Integrals	2	CO6
4.3	Green's Theorem in the Plane	1	CO6
4.4	Surface Integrals	1	CO6
4.5	Triple Integrals. Divergence Theorem of Gauss	1	CO6
4.6	Applications of the Divergence Theorem	1	CO6
4.7	Stoke's Theorem	1	CO6
	TOTAL No. of Hours	36	

Course Designers

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18CS220	PROBLEM SOLVING USING COMPUTERS

Category	L	T	P	Credit
ES	3	0	0	3

Preamble

This course is intended for the candidate who desires to learn problem-solving techniques and the design of computer solutions in a precise manner. The course emphasizes problem-solving methodologies, algorithm designs and developments and computer-programming skills.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Explain an algorithmic solution for the given requirements using problem decomposition and step-wise refinement. (Understand)	10
CO2	Construct algorithms for solving engineering problems using appropriate repetition and selection constructs. (Apply)	20
CO3	Demonstrate fundamental programming knowledge by designing structured programs and algorithms with the help of fundamental data structures. (Understand)	15
CO4	Solve searching, sorting and string manipulation problems using iteration or modularization as applicable. (Apply)	20
CO5	Describe methods for text processing and pattern searching. (Understand)	15
CO6	Develop programs based on the algorithms devised for solving problems. (Apply)	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	-	1.2
CO2	TPS3	Apply	Value	-	1.2,2.5.4
CO3	TPS2	Understand	Respond	-	1.2
CO4	TPS3	Apply	Value	-	1.2,2.4.1

CO5	TPS2	Understand	Respond	-	1.2
CO6	TPS3	Apply	Value	Mechanism	1.2,2.5.1,2.5.2, 2.4.7

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	M	L									L	M		
CO2	S	S	M		L	L		L	L			L	S	L	L
CO3	M	M	L		L							L	M		
CO4	S	S	M		L	L		L	L			L	S	L	L
CO5	M	M	L									L	M		
CO6	S	S	M		S	L		L	L			L	S	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	20	-	-	-	20
Understand	50	40	40	30	20	20	40
Apply	30	40	40	70	50	50	40
Analyse	-	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Assignment 2,3
Perception	-
Set	-
Guided Response	-
Mechanism	30
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1(CO1):

1. Draw the flowchart to find the biggest of 3 numbers (Understand)
2. Explain the pseudo code to get three marks of a student and find the average of 3 marks and display it. (Understand)

Course Outcome 2(CO2):

1. Write a pseudo code to generate Fibonacci series up to ‘n’ terms. (Apply)

2. Develop an algorithm that will read two integer numbers and an integer code from user. The value of the integer code should be 1, 2 or 3. The table below specifies the process to be taken based on the integer code. The program displays the computed result to the screen.(Apply)

Integer code	Tasks/Actions to be taken
1	Compute the sum of the two numbers
2	Compute the difference of the two numbers (first number– second number)
3	Compute the product of the two numbers
4	Display error

Course Outcome 3(CO3):

1. Discuss the logic of algorithm that will get an array of 10 character letters, count the number of vowels in the array. A letter, such as a, e, i, o, and u in the English alphabet represents a vowel. The algorithm is then to display the number of vowels in the array. (Understand)
2. Give an algorithm that gets the maximum and minimum value in a dictionary. (Understand)

Course Outcome 4 (CO4):

1. Develop an algorithm to compare two strings. (Apply)
2. Given an array arr = {4, 6, 72, 81, 91} and key = 81; How many iterations are done until the element is found in Binary Search? (Apply)
3. Develop an algorithm with swap_case function that works like this: (Apply)
   i/p : Hello
   o/p: hELLO

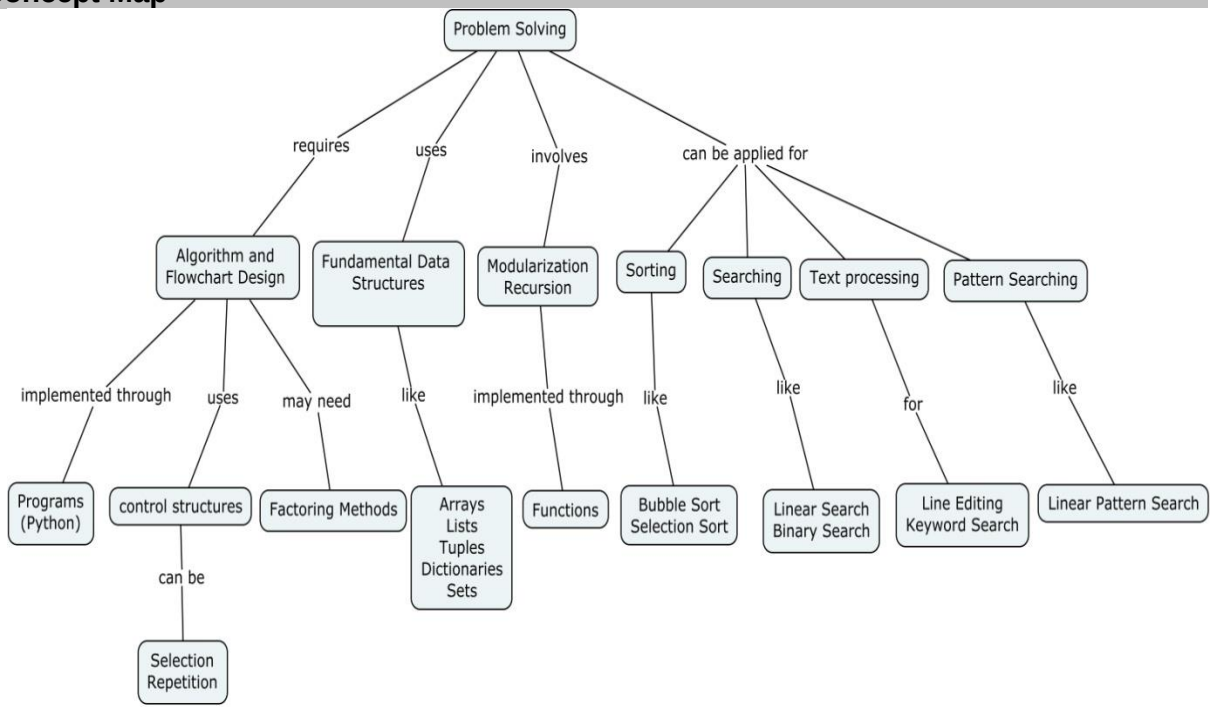
Course Outcome 5 (CO5):

1. What is text processing? (Understand)
2. Explain the algorithm for linear pattern searching. (Understand)

Course Outcome 6(CO6):

1. Write a program for binary search. (Apply)
   TestData :
   binary_search([1,2,3,5,8],6)
   Output:
   False
2. Write a program that accepts a string and calculate the number of digits and letters. (Apply)
   Sample Data : Version 5.6.2
   Output :
   Letters 7
   Digits 3
3. Write a program to remove an item from a set if it is present in the set. (Apply)

Concept Map



Syllabus

Introduction to Computer Problem Solving: Problem Solving aspect, Top down Design, Flowcharts, Developing an Algorithm

Efficiency of algorithms, Analysis of algorithms, Problem solving using fundamental algorithms - Exchanging the values of two variables, Counting. Selection Control Structures, Repetition Control Structures**,** Algorithms Using Selection and Repetition - Summation of a set of numbers, Reversing Digits of an Integer.

Factoring Methods – Finding Square root of a number, smallest divisor of an integer, Greatest common divisor of two integers, Generating Prime numbers, Implementation of fundamental algorithms and factoring methods.

Array Techniques: Array order reversal, Array Counting, Finding maximum and the minimum value in a set, Modularization and recursion. Collection data types– Tuples, Lists, Sets, and Dictionaries, Implementation of array techniques and Collection data types.

Sorting and Searching: Bubble Sort, Selection Sort, Linear Search, Binary Search, Implementation of sorting and searching.

Text Processing and Pattern Searching: Text line editing, keyword searching, and linear pattern searching, and Implementation of Text Processing and pattern searching.

Learning Resources

1. How to solve it by Computer, R.G Dromey, Pearson education, Delhi, 2008.
2. Simple Program Design, A Step-by-Step Approach, Lesley Anne Robertson, 5th Edition, Thomson, 2007.
3. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
4. Mark Summerfield. —Programming in Python 3: A Complete introduction to the Python Languagell, Addison-Wesley Professional, 2009.

5. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Martin C. Brown, —PYTHON: The Complete Reference‖, McGraw-Hill, 2001.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Course Outcome
1	**Introduction to Computer Problem Solving**		
1.1	Problem Solving aspect, Top down Design	1	CO1
1.2	Flowcharts	1	CO1
1.3	Developing an Algorithm	1	CO1
1.4	Efficiency of algorithms, Analysis of algorithms	1	CO1
1.5	Problem Solving using Fundamental Algorithms - Exchanging the values of two variables, Counting	1	CO1
2	**Control Structures and Factoring Methods**		
2.1	Selection Control Structures, Repetition Control Structures	3	CO2
2.2	Summation of a set of numbers	2	CO2
2.3	Reversing Digits of an Integer	2	CO2
2.4	Factoring Methods: Finding Square root of a number, smallest divisor of an integer	2	CO3
2.5	Greatest common divisor of two integers, Generating Prime numbers.	3	CO3
2.6	Implementation of fundamental algorithms and factoring methods	3	CO6
3	**Array Techniques**		
3.1	Array order reversal, Array Counting, Finding maximum and the minimum value in a set.	2	CO4
3.2	Modularization and recursion	1	CO4
3.3	Collection data types – Tuples, Lists, Sets, and Dictionaries.	1	CO4
3.4	Implementation of array techniques and Collection data types.	2	CO6
4	**Sorting and Searching**		
4.1	Bubble Sort, Selection Sort	2	CO4
4.2	Linear Search, Binary Search	1	CO4
4.3	Implementation of sorting and searching.	2	CO6
5	**Text Processing and Pattern Searching**		
5.1	Text line editing	1	CO5
5.2	keyword searching, and linear pattern searching	1	CO5
5.3	Implementation of text processing	2	CO5
5.4	Implementation of pattern searching.	1	CO5
	Total	**36**	

Course Designers:

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		Category	L	T	P	Credit
18CS230	**DIGITAL CIRCUITS**	PC	3	0	0	3

Preamble

The syllabus is designed for the students to understand and apply the basic principles of number systems, binary arithmetic, Boolean algebra, digital logic gates, design and implementation of combinational logic circuits and analysis and design of sequential logic circuits. It illustrates different methods for simplification of Boolean logic functions. These methods include algebraic simplification, karnaugh maps and Quine McCluskey tabulation technique. Then the principles of combinational logic circuits, their design and implementation using programmable logic are presented. Also, simulation of combinational logic circuits using HDL is discussed. The fundamental concepts of synchronous sequential logic circuits, their analysis and the design techniques are exemplified.

Prerequisite

Nil

Course Outcomes

CO Number	Course Outcome Statement	Weightage in %
CO1	Explain the principles of number systems, binary codes, arithmetic and code conversions (understand)	10
CO2	Perform simplification of logic functions by applying the theorems and postulates of Boolean algebra, the techniques of Karnaugh Maps and Quine McClusky tabulation. (Apply)	20
CO3	Design combinational logic circuits for various applications, implement them using logic gates or other devices like multiplexers, decoders or programmable logic devices. (Apply)	20
CO4	Understand the simulation of combinational logic circuits using HDL description. (Understand)	15
CO5	Construct the state tables and diagrams for the given sequential logic circuits.(Apply)	20
CO6	Design Moore and Mealy type sequential circuits and Implement them using different types of flip flops (Apply)	15

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	

CO1	TPS2	Understand	Respond	--	1.2
CO2	TPS3	Apply	Value	-	1.2,2.1.1
CO3	TPS3	Apply	Value	-	1.2,2.1.1
CO4	TPS2	Understand	Respond	--	1.2
CO5	TPS3	Apply	Value	--	1.2,2.1.1
CO6	TPS3	Apply	Value	--	1.2,2.1.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L										M		
CO3	S	M	L										M		
CO4	M	L											L		
CO5	S	M	L										M		
CO6	S	M	L										M		

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	10	10	10	-	-	-	10
Understand	30	30	20	-	-	-	30
Apply	60	60	70	100	100	100	60
Analyse	-	-	-	-		-	-
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain how the operation -43-91 may be performed using 1's and 2's complement notations. (Understand).
2. Explain the drawback of 1's complement form for representing signed binary numbers. (Understand)
3. Explain the conversion of the binary fraction 110011.011 to decimal(Understand)
4. Explain how Excess-3 is a self-complementing code. (Understand)

Course Outcome 2 (CO2):

1. Utilise the theorems of Boolean algebra to simplify f = a'bc'+a'b'+abc' (Apply)
2. Make use of Karnaugh map to obtain minimal POS form of g = ∑m(0,2,4,6,9,12,14) (Apply)
3. Construct the simplified SOP form of h = ∑m(3,5,7,9,13,15,17) + ∑d(12,14) using QM tabulation. (Apply)

Course Outcome 3 (CO3):

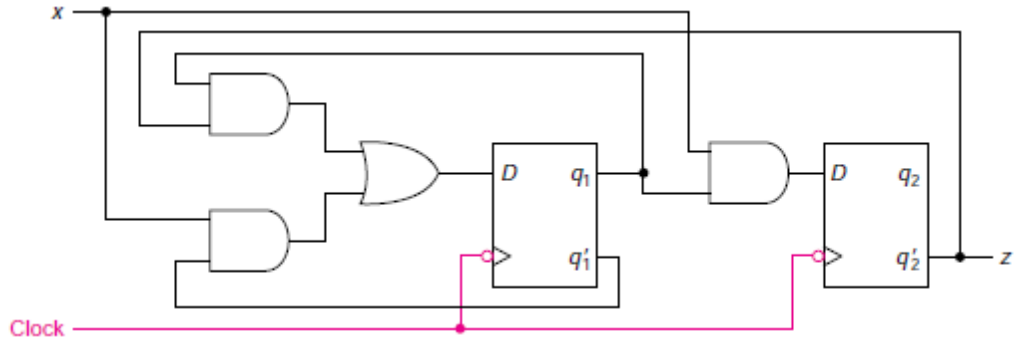
1. Design a 2- bit magnitude comparator to compare two binary numbers. (Apply)
2. Design a 4-input priority encoder (Apply)
3. Construct the ROM implementation of G = ∑m(0,1,2,4,7,9,12) (Apply)
4. Make use of a 4 to 1 multiplexer to implement the function h = ∑m(2,4,6,7) (Apply)
5. Make use of a 4 to 16 decoder to implement f = ∑m(3,5,7,8,9,15) (Apply)
6. Construct the PLA implementation of the functions f = AB'+AC+A'BC' and G = (AC+BC)' (Apply)

Course Outcome 4(CO4):

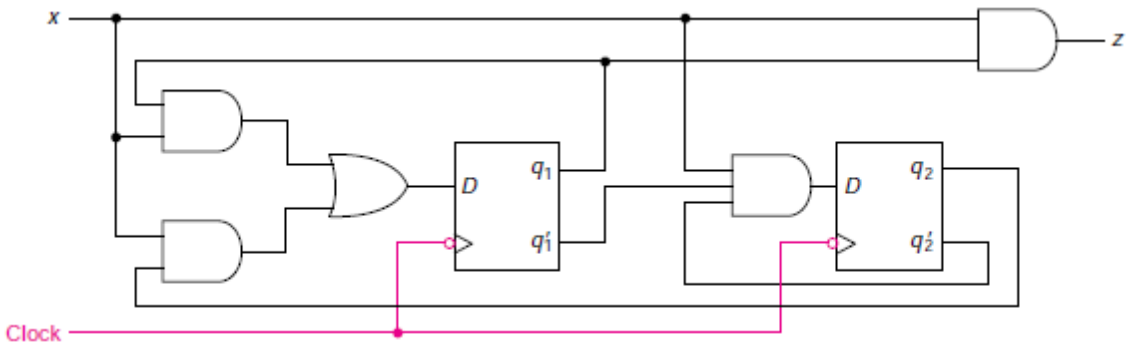
1. Explain the gate level description of a full adder. (Understand).
2. Explain the gate level description of a 2 to 4 decoder. (Understand)

Course Outcome 5 (CO5):

1. Construct the state table and diagram for the following Moore type circuit. (Apply)



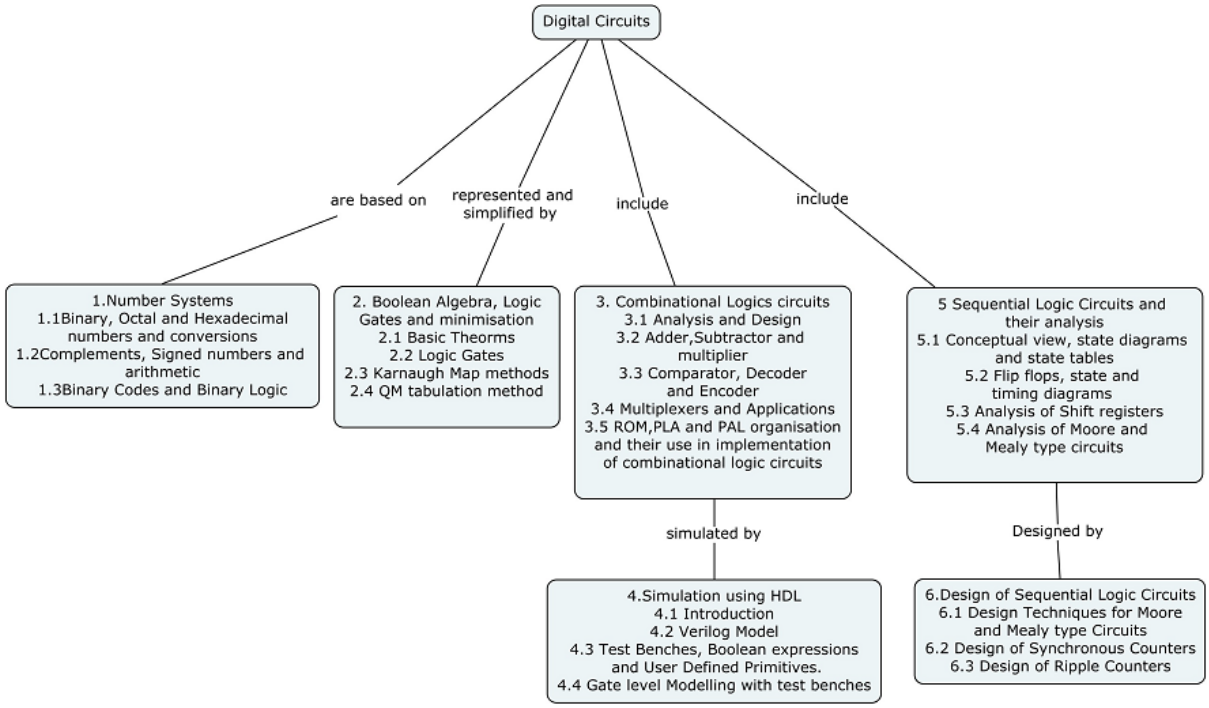
2. Construct the state diagram and table for the following Mealy type circuit and. (Apply)



Course Outcome 6 (CO6):

1. Design a 2-bit synchronous up counter and construct it using JK flip flops. (Apply)
2. Design a Moore type sequence detector to detect the overlapping input sequence 101 and implement it using D flip flops.(Apply)

Concept Map



Syllabus

Number Systems:

Binary Numbers, Octal and Hexadecimal Numbers and conversions, Complements - Signed Binary Numbers and arithmetic, Binary Codes and Binary Logic.

Boolean Algebra, Logic Gates and gate level minimisation

Basic Definition, Theorems and Properties of Boolean Algebra, Boolean functions, Digital Logic Gates and Other Logic Operations, The Karnaugh Map Method of minimisation– Three and Four Variable Maps, Quine-McCluskey (QM) Technique.

Combinational Logic Circuits:

Introduction to Combinational Circuits, Analysis and Design Procedure, Binary Adder-Subtractor, Binary multiplier, Magnitude comparator, Decoders and Encoders, Multiplexers and their applications. Organization of ROM, PLA and PAL and their application in implementing combinational logic circuits.

Simulation using HDL:

Introduction to Hardware Description Language, Verilog model of a simple combinational circuit, propagation delays, test benches, Boolean expressions, user defined primitives, gate level modelling with test benches.

Sequential Logic Circuits and their operation

Conceptual view of Sequential Circuits, State tables and diagrams. Flip-flops and their state and timing diagrams. Operation of shift registers. Principles and operation of Mealy and Moore machines.

Design of Sequential Logic Circuits

Design techniques for Moore and Mealy type circuits. Design of synchronous counters. Design of ripple counters.

Learning Resources:

1. M.Morris Mano & Michael D.Ciletti, Digital Design With an Introduction to Verilog HDL, fifth edition, Pearson, 2013.
2. Alan B Marcovitz, Introduction to Logic Design, third edition, McGraw Hill, 2010
3. Mohammed Ferdjallah, Introduction to digital systems, Modeling, Synthesis and simulation using VHDL, Wiley,2011.
4. D.P. Leach & A.P. Malvino, Digital Principles and Applications, sixth edition, Tata McGraw Hill,2006.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Course Outcome
1	**Number Systems**		
1.1	Binary Numbers, Octal and Hexadecimal Numbers and conversions	1	CO1
1.2	Complements - Signed Binary Numbers and arithmetic	2	CO1
1.3	Binary Codes and binary logic	1	CO1
2	**Boolean Algebra, Logic Gates and gate level minimization :**		
2.1	Basic Definitions, Theorems and Properties of Boolean Algebra - Boolean functions	2	CO2
2.2	Digital Logic Gates and Other Logic Operations	1	CO2
2.3	Simplification of logic functions using Karnaugh Map	2	CO2

Module No.	Topic	No. of Lectures	Course Outcome
	Method – Three and four Variable Maps		
2.4	Quine-McCluskey(QM) Technique	2	CO2
3	**Combinational Logic Circuits**		
3.1	Introduction to Combinational Logic Circuits and their analysis and design	1	CO3
3.2	Binary Adder, Subtractor and multiplier	1	CO3
3.3	Magnitude comparator, decoder and encoder	1	CO3
3.4	Multiplexers and their applications	1	CO3
3.5	Organization of ROM, PLA and PAL and their application in implementing combinational logic circuits.	3	CO3
4	**Simulation of Combinational Logic Circuits using HDL**		
4.1	Introduction to Hardware Description Language	1	CO4
4.2	Verilog model of a simple combinational circuit, propagation delays	1	CO4
4.3	Test benches, Boolean expressions, user defined primitives	1	CO4
4.4	Gate level modeling with test benches.	2	CO4
5	**Sequential Logic Circuits and their operation**		
5.1	Conceptual view of sequential circuits, state tables and diagrams.	2	CO5
5.2	Types of flip flops, their state diagrams and timing diagrams	2	CO5
5.3	Operation of shift registers operation.	1	CO5
5.4	Principles and operation of Mealy and Moore type circuits	2	CO5
6	**Design of Sequential Logic Circuits**		
6.1	Design techniques for Moore and Mealy type circuits	3	CO6
6.2	Design of synchronous counters	2	CO6

Module No.	Topic	No. of Lectures	Course Outcome
6.3	Design of ripple counters	1	CO6
Total		36	

Course Designer:

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2. R.Chellamani (rcmcse@tce.edu)

18CS240	COMPUTER ORGANIZATION AND ARCHITECTURE

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

The syllabus is designed for the students to learn and understand the basic organization of computers and the working of its functional components. It gives a brief overview of the organization of a computer, simple Von Neumann machine organization of IAS computer, memory format and instruction execution in it. Then memory hierarchy, types of memories, organization of main memory, types of IO buses, and their operation and timing diagrams are presented. Then the elements of cache memory design, its mapping functions and replacement algorithms are emphasized followed by performance estimation of disk drives under interrupt driven and DMA driven approaches are discussed.

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Explain the evolutions of computers, the organizational features, structure, memory format and operation of IAS computers, components of a computer and its instruction cycle with and without interrupts.(Understand)	15
CO2	Estimate the data transfer rate and the length of the instruction cycle for synchronous read and write cycles, with an understanding of the bus interconnection and timing diagrams for synchronous and asynchronous buses. (Apply)	20
CO3	Explain the features of main memory organization and its types. (Understand)	15
CO4	Design the cache memory organization, its mapping functions and replacement algorithms and estimate the performance improvement(Apply)	20
CO5	Explain the features of IO transfer and DMA transfer using interrupts (Understand)	10
CO6	Perform integer and floating point arithmetic operations on binary numbers.(Apply)	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	-	1.2
CO2	TPS3	Apply	Value	-	1.2 ,2.1.1
CO3	TPS2	Understand	Respond	-	1.2
CO4	TPS3	Apply	Value	-	1.2 ,2.1.1

CO5	TPS2	Understand	Respond	-	1.2
CO6	TPS3	Apply	Value	-	1.2 ,2.1.1

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	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
CO1	S												L		
CO2	S	S	M	L									S	L	
CO3	S												L		
CO4	S	S	S	M									S	L	
CO5	S												L		
CO6	S	S	M	L									S	L	

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	30	30	-	-	-	30
Understand	40	40	30	-	-	-	40
Apply	30	30	40	100	100	100	30
Analyse	-	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1(CO1):

1. List the basic functions a computer can perform. (Remember)
2. Distinguish between computer structure and computer function? (Understand)
3. List the features of a Von Neumann computer? (Remember)

Course Outcome 2(CO2):

1. For a synchronous read operation, the memory module must place the data on the bus sufficiently ahead of the falling edge of the Read signal to allow for signal settling. Assume a

microprocessor bus is clocked at 10 MHz and that the Read signal begins to fall in the middle of the second half of T3. Determine the length of the memory read instruction cycle. When, at the latest, should memory data be placed on the bus? Allow 20 ns for the settling of data lines. (Apply)

2. Develop an ALP to perform Packed BCD addition . (Apply)

Course Outcome 3(CO3):

1. List the properties of semiconductor memory cells. (Remember)
2. Explain the operation of a DRAM cell.(Understand)
3. List the applications ROM. (Remember)

Course Outcome 4 (CO4):

1. For a direct-mapped cache, a main memory address is viewed as consisting of three fields. List and define the three fields. (Remember)
2. A set-associative cache consists of 64 lines, or slots, divided into four-line sets. Main Memory contains 4K blocks of 128 words each. Show the format of main memory addresses. (Understand)
3. Given the following specifications for an external cache memory: four-way set associative; line size of two 16-bit words; able to accommodate a total of 4K 32-bit words from main memory; used with a 16-bit processor that issues 24-bit addresses. Design the cache structure with all pertinent information and show how it interprets the processor's addresses. (Apply)
4. A computer system uses 16-bit memory addresses. It has a 2K-byte cache organized in a direct-mapped manner with 64 bytes per cache block. Assume that the size of each memory word is 1 byte. (a) Calculate the number of bits in each of the Tag, Block, and Word fields of the memory address. (b) When a program is executed, the processor reads data sequentially from the following word addresses: 128, 144, 2176, 2180, 128, 2176 All the above addresses are shown in decimal values. Assume that the cache is initially empty. For each of the above addresses, indicate whether the cache access will result in a hit or a miss.

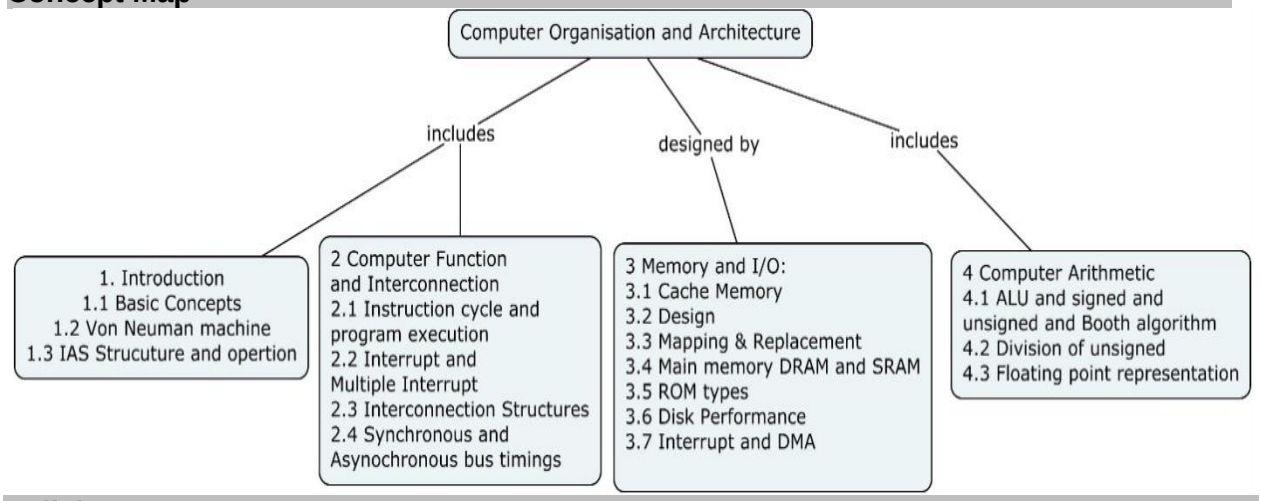
Course Outcome 5 (CO5):

1. State the need for DMA
2. Define Interrupt.

Course Outcome 6(CO6):

1. Use the Booth algorithm to multiply 23 (multiplicand) by 29 (multiplier), where each number is represented using 6 bits. (Apply)
2. Illustrate the steps required for Floating point addition and show the steps for performing addition of 0.8125_{ten} and -0.0625_{ten} (Apply)

Concept Map



Syllabus

Introduction: Computer organization and architecture, Vonneumann machine, Evolution of computers and generations, Introduction to IAS computer structure and operation.

Computer Function and Interconnection: Top level view of components and functions, Instruction cycle and program execution, Interrupts and instruction cycles, multiple interrupts, Interconnection structures, Bus interconnection, multiple buses, Synchronous and asynchronous bus timings.

Memory and I/O : Characteristics and hierarchy of memory, Cache memory principles and operation, Cache design and mapping functions, replacement algorithms, main memory, DRAM and SRAM, Types of ROMs, Module organization, Introduction to magnetic disks, I/O transfer and disk performance, interrupt driven and DMA transfers.

Computer Arithmetic : Arithmetic and Logic Unit, Integer multiplication of unsigned and signed numbers, Booth's algorithm, division of unsigned binary, Floating point arithmetic.

Learning Resources

1. William Stallings, Computer Organization and Architecture Designing for Performance, Nineth edition, Prentice Hall, 2013.
2. Andrew S Tanenbaum and Todd Austin, Structured Computer Organization, Sixth edition, Pearson, 2013.
3. Carl Hamacher, Computer Organization and Embedded Systems, Sixth edition, McGrawHill, 2012.
4. DodiyaTripti, Computer Organisation and Advanced Microprocessors, First edition, Cengage Learning India,2012.
5. Barry B.Brey, The Intel Microprocessors Architecture Programming and Interfacing, Eighth edition, Pearson Prentice Hall, 2009.
6. N.Senthil Kumar, M.Saravanan and S. Jeevananthan, Microprocessors and Microcontrollers, First edition, Oxford University Press, 2010.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Course Outcome
1	**Introduction:**		
1.1	Computer organisation and architecture.	1	CO1
1.2	Evolution of generation of computers and VonNeuman machine.	2	CO1
1.3	Introduction to IAS computer structure and operation	2	CO1
2	**Computer Function and Interconnection:**		
2.1	Top level view of components and functions, Instruction cycle and program execution	1	CO2
2.2	Interrupts and instruction cycles, multiple interrupts	2	CO2
2.3	Interconnection structures, Bus interconnection, multiple buses	2	CO2
2.4	Synchronous and asynchronous bus timings.	2	CO2
3	**Memory and I/O:**		
3.1	Characteristics and hierarchy of memory, Cache memory principles and operation.	2	CO4
3.2	Cache design	3	CO4
3.3	mapping functions and replacement algorithms	2	CO4
3.4	Main memory, DRAM and SRAM	3	CO3
3.5	Types of ROMs, Module organization	3	CO3
3.6	Introduction to magnetic disks, I/O transfer and disk performance,	2	CO5
3.7	Interrupt driven and DMA transfers	2	CO5
4	**Computer Arithmetic:**		
4.1	Arithmetic and Logic Unit, Integer multiplication of unsigned and signed numbers, Booth's algorithm	3	CO6
4.2	Division of unsigned binary numbers	2	CO6
4.3	Floating point representation.	2	CO6
	Total	36	

Course Designers:

1. Mr.R.Chellamani rcmcse@tce.edu
2. Dr.T.Manikandan tmcse@tce.edu

18CS260	COMPUTER PROGRAMMING

Category	L	T	P	Credit
PC	2	0	1	3

Preamble

The course on computer programming is intended to introduce the students to computational thinking, procedural programming and constructs of procedural programming. On Completion of the course students would be able to master structured programming and demonstrate applications on top of procedural programs.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Describe the basic components of the structured programming (Understand)	15
CO2	Implement different operations on arrays and strings(Apply)	20
CO3	Develop programs with recursive solutions utilizing functions (Apply)	15
CO4	Demonstrate dynamic memory allocation using pointers. (Apply)	15
CO5	Illustrate the appropriate algorithms for sorting and searching problems. (Apply)	15
CO6	Implement file operations in C Programming for a given application (Apply)	20

CO Mapping with CDIO Curriculum Framework

CO	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2
CO2	TPS3	Apply	Value	Mechanism	1.2 ,2.2.3,2.5.1
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.2.3,2.5.1
CO4	TPS3	Apply	Value	Mechanism	1.2,2.2.3,2.5.1
CO5	TPS3	Apply	Value	Mechanism	1.2,2.4.7,2.2.3,2.5.1
CO6	TPS3	Apply	Value	Mechanism	1.2,2.2.3,2.4.6,2.5.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	L											L		
CO2	S	M	L		L				L		L	L	M		L
CO3	S	M	L		L				L		L	L	M		L

CO4	S	M	L		L				L		L	L	M		L
CO5	S	M	L		L				L		L	L	M		L
CO6	S	M	L		L				L		L	L	M		L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Practical Component			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	15				15
Understand	40	30	25	25	25	25	25
Apply	40	50	60	25	25	25	60
Analyse	-	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Practical Component
Perception	-
Set	-
Guided Response	25
Mechanism	25
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Explain various data types.
2. Describe format specifiers.

Course Outcome 2 (CO2):

1. Write a C program that accepts an employee's ID, total worked hours of a month and the amount he received per hour. Print the employee's ID and salary (with two decimal places) of a particular month.
2. Write a program in C to input a string and print it.
3. Write a program in C to print individual characters of string in reverse order.

Course Outcome 3 (CO3):

1. Write a program in C to print first 50 natural numbers using recursion. (Apply)
2. Write a program in C to find the sum of the series 1!/1+2!/2+3!/3+4!/4+5!/5 using the function.(Apply)

Course Outcome 4 (CO4):

1. Write a program in C to demonstrate the use of &(address of) and *(value at address) operator. (Apply)
2. Write a program in C to find the maximum number between two numbers using a pointer(Apply)
3. Write a program in C to print all permutations of a given string using pointers.(Apply)

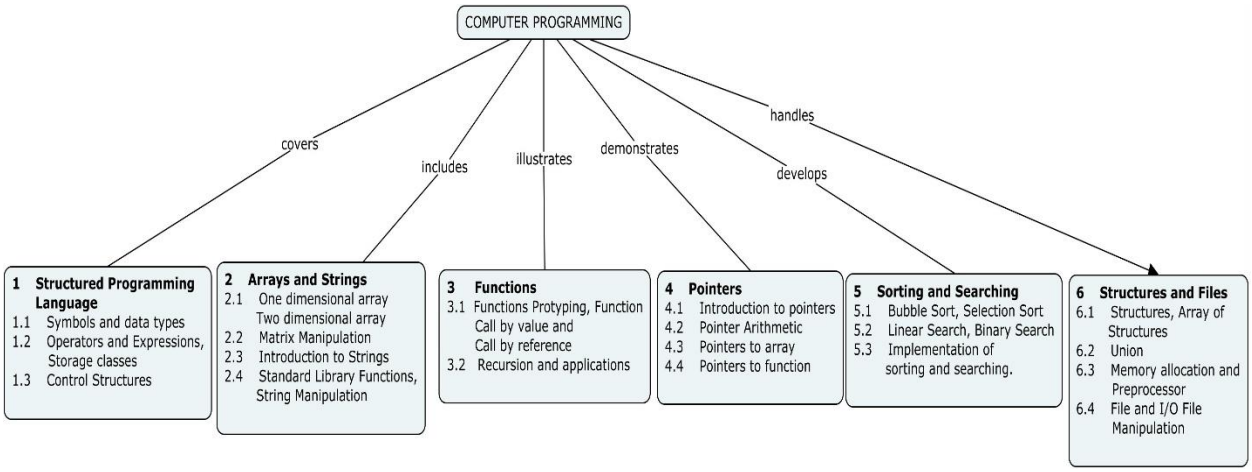
Course Outcome 5 (CO5):

1. Write a program for binary search. (Apply)
   TestData :
   binary_search([1,2,3,5,8],6)
   Output:
   False
2. Write a program that accepts a string and calculate the number of digits and letters. (Apply)
   Sample Data : Version 5.6.2
   Output :
   Letters 7
   Digits 3
3. Write a program to remove an item from a set if it is present in the set. (Apply)

Course Outcome 6(CO6):

1. Write a program in C to create and store information in a text file.(Apply)
2. Write a program to count the number of words, sentences and paragraphs in a given text using files.(Apply)
3. Write a C program to read name and marks of n number of students from user and store them in a file.(Apply)

Concept Map



Syllabus

Structured Programming Language Symbols and data types - Operators and Expressions - Storage classes - Looping control structures - Decision control structures - Case control structures.

Arrays and Strings One dimensional array - Two dimensional array - Matrix Manipulation - Introduction to Strings - Standard Library Functions - String manipulation applications.

Functions Function Prototyping - Function Call by value - Function Call by reference - Recursion.

Pointers Introduction to pointers - Pointer Arithmetic - Pointers to array - Pointers to function.

Sorting and Searching Bubble Sort, Selection Sort Linear Search, Binary Search Implementation of sorting and searching.

Data Handling Structures - Array of Structures -Union - Memory allocation - File and I/O - File Manipulation

Learning Resources

1. Programming In ANSI C, E. Balaguruswamy, McGrawHill Publications.7th Edition 2016,
2. YeshavantKanetkar: Understanding Pointers In C & C++ …5th Revised & Updated Edition Pointers in all its forms Fully working examples and Applications of Pointers,BPB Publications 5th edition, 2018
3. YashavantKanetkar: ANSI C Programming,, BPB Publications ,2nd Edition
4. YashavantKanetkar: Let us C, BPB Publications, 8th Edition,2008

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Course Outcome
1	**Structured Programming Language**		
1.1	Symbols and data types	1	CO1
1.2	Operators and Expressions, Storage classes	1	CO1
1.3	Control Structures	2	CO1
2	**Arrays and Strings**		
2.1	One dimensional array Two dimensional array	1	CO2
2.2	Matrix Manipulation	1	CO2
2.3	Introduction to Strings	1	CO2
2.4	Standard Library Functions, String Manipulation	2	CO2
3	**Functions**		
3.1	Functions Prototyping, Function Call by value and Call by reference	1	CO3
3.2	Recursion and applications	2	CO3
4	**Pointers**		
4.1	Introduction to pointers	1	CO4
4.2	Pointer Arithmetic	1	CO4
4.3	Pointers to array	1	CO4
4.4	Pointers to function	1	CO4
5	**Sorting and Searching**		
5.1	Bubble Sort, Selection Sort	1	CO5
5.2	Linear Search, Binary Search	1	CO5
5.3	Implementation of sorting and searching	1	CO5
6	**Structures and Files**		
6.1	Structures, Array of Structures	1	CO6
6.2	Union	1	CO6
6.3	Memory allocation and Preprocessor	1	CO6
6.4	File and I/O File Manipulation	2	CO6

Course Contents and Lecture Schedule for Laboratory

Module No.	Topic	No. of Lectures	Course Outcome
1.	Write a Simple C program using constructs	2	CO1
2.	Write a C program to display multiple variables.	2	CO1
3.	Design a C Program for Array types	2	CO2
4.	Design a C Program for String manipulations	2	CO2

Module No.	Topic	No. of Lectures	Course Outcome
5.	Write a C Program using different types of function call	2	CO3
6.	Write a C Program for recursive function	2	CO3
7.	Write a program in C to store n elements in an array and print the elements using pointer	2	CO4
8.	Write a C Program using pointer to a function	2	CO4
9.	Write a C program to sort a list of elements using different sorting algorithms	2	CO5
10.	Write a C Program for implementing for binary search algorithm	2	CO5
11.	Write a C Program using structures and union	2	CO6
12.	Write a C Program for implementing file operation	2	CO6
	Total Hours	**24**	

Course Designers:

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2. Ms. M.Nirmala Devi mnit@tce.edu
3. Dr.R.Leena Sri rlsit@tce.edu

		Category	L	T	P	Credit
18CS270	**DIGITAL CIRCUITS LAB**	PC	0	0	1	1

Preamble

Preamble: The laboratory course is designed to enable the students to design and construct practically the combinational and sequential logic circuits for different applications. The list of experiments starts with the verification of Boolean theorems and truth table of gates. Then the design and construction of a variety of circuits using gates, flip flops and other devices are performed. The simulation of simple circuits using Hardware Description Language is also performed. These experiments will reinforce the concepts learnt in the corresponding theory course.

Prerequisite

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Verify the truth tables of Boolean logic gates and theorems of Boolean algebra	10
CO2	Design half adder, full adder and parallel binary adder	10
CO3	Design BCD adder	10
CO4	Design multiplexer, demultiplexer/decoder and encoder	20
CO5	Design magnitude comparator	10
CO6	Design ripple counters	10
CO7	Design synchronous counters	10
CO8	Design sequential logic circuits	10
CO9	Simulate combinational logic circuits using HDL	10

.

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 1.2.7 ,2.2.3
CO2	TPS3	Apply	Value	Mechanism	1.2,1.2.7 ,2.2.3
CO3	TPS3	Apply	Value	Mechanism	1.2, 1.2.7 ,2.2.3
CO4	TPS3	Apply	Value	Mechanism	1.2, 1.2.7 ,2.2.3
CO5	TPS3	Apply	Value	Mechanism	1.2, 1.2.7 ,2.2.3
CO6	TPS3	Apply	Value	Mechanism	1.2, 1.2.7 ,2.2.3
CO7	TPS3	Apply	Value	Mechanism	1.2, 1.2.7. ,2.2.3
CO8	TPS4	Apply	Value	Mechanism	1.2, 1.2.7 ,2.2.3
CO9	TPS3	Apply	Value	Mechanism	1.2, 1.2.7 ,2.2.3

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO7.	S	M	M		S	L	L	S	S	S		M	M	M	M
CO8.	S	M	M		S	L	L	S	S	S		M	M	M	M
CO 3	S	M	M		S	L	L	S	S	S		M	M	M	M
CO 4	S	M	M		S	L	L	S	S	S		M	M	M	M
CO 5	S	M	M		S	L	L	S	S	S		M	M	M	M
CO 6	S	M	M		S	L	L	S	S	S		M	M	M	M
CO 7	S	M	M		S	L	L	S	S	S		M	M	M	M
CO 8	S	M	M		S	L	L	S	S	S		M	M	M	M
CO 9	S	M	M		S	L	L	S	S	S		M	M	M	M

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember		
Understand		
Apply	50	50
Analyse		
Evaluate		
Create		

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Practical Component/Observation
Perception	
Set	
Guided Response	
Mechanism	50
Complex Overt Responses	--
Adaptation	
Origination	

List of Experiments/Activities with CO Mapping

Experiment	CO
Verification of truth tables of logic gates and theorems of Boolean algebra, using digital IC trainer kit.	CO1
Design, construction and testing of half adder, full adder and 2-bit parallel binary adder.	CO2
Design of single digit BCD adder, its construction using 4-bit parallel binary adder ICs and verification of output.	CO3
Design, construction and testing of 4 to 1 multiplexer, 2*4 decoder/1 to 4 demultipexer and realization of half adder using it.	CO4
Design, construction and testing of 4*2 encoder and realization of binary to gray code converter using decoder-encoder cascade.	CO4
Design, construction and testing of 2-bit binary magnitude comparator	CO5
Design, construction and testing of ripple up and down counters for a given modulus and also for any specified count sequence.	CO6
Design, construction and testing of synchronous counters for any specified count sequence.	CO7
Implement sequence detectors.	CO8
Simulation of a half adder, full adder, encoder and decoder using HDL	CO9

Course Designers:

1. C.Sridharan (cscse@tce.edu)
2. R.Chellamani (rcmcse@tce.edu)

18CS280	WORKSHOP

Category	L	T	P	Credit
ES	0	0	1	1

Preamble

This is the foundation practical course for CSE students. The aim of this course is to impart fundamental hands-on skill in carrying out experiments at higher semester practical courses.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Realize the importance of earthing in electrical safety and trouble shoot the electrical wiring and measure electrical parameters	8
CO2	Accurately discriminate and use fuses, circuit breakers, AFO, CRO, digital and analog meters in electronic circuits	17
CO3	Solder and desolder of electronic components and convert schematic into PCB layout and fabrication	25
CO4	Assemble and configure a computer and install software's on hardware	25
CO5	Work with Unix and DOS commands.	8
CO6	Design and develop a document or report using Desktop publishing software.	17

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2, 2.4.5
CO2	TPS2	Understand	Respond	Guided Response	1.2, 2.4.5
CO3	TPS2	Understand	Respond	Guided Response	1.2, 2.4.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.4.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.4.5
CO6	TPS3	Apply	Value	Mechanism	1.2, 2.4.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S		L		M				M	M			M	M	M
CO2	S		L		M				M	M			M	M	M
CO	S		L		M				M	M			M	M	M

3															
CO 4	S		L		M				M	M			M	M	M
CO 5	S		L		M				M	M			M	M	M
CO 6	S		L		M				M	M			M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	---	---
Understand	20	---
Apply	50	---
Analyse	---	---
Evaluate	---	---
Create	---	---

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Practical Component/Observation
Perception	---
Set	--
Guided Response	10
Mechanism	20
Complex Overt Responses	--
Adaptation	--
Origination	---

List of Experiments/Activities with CO Mapping

Ex.No	List of Experiments	No. of Hours	Course Outcome
Electrical and Electronics Engineering			
1.	Earthing practice and its significances; Wiring practices and testing	2	CO1
2.	Realization and Discrimination of fuses and Circuit breakers; Functionalities of RPS/AFO/CRO	2	CO2
3.	Functionalities and Selection of Analog and Digital meters	2	
Electronics and Communication Engineering			
4.	Identifying electronic components and understanding PCB glossary	2	CO3
5.	Conversion of schematic into PCB layout and PCB fabrication	2	
6.	Practicing of soldering and desoldering	2	
Computer Science and Engineering			

7.	Computer Assembly and Configuration: PC Assembling: Steps for assembling a PC-commonly used devices an overview, assembling a SMPS in a cabinet, fixing a processor in a mother board, assembling RAM in a motherboard, pinning a cooling fan in a mother board, Assembling a hard disc drive in a cabinet, assembling a CD/DVD ROM in a cabinet. Assembling a floppy drive in a cabinet, fixing motherboard In a cabinet, Connecting the cables from the SMPS to motherboard, hard disc, drives &etc, Establishing data connection for to motherboard, hard disc, drives. Fixing wires for power restart switches, fixing wires for power & HDD LED's, fixing wires for external USB and Audio connections	6	CO4
8.	System Installation:Steps for installing software's for hardware, Hardware & Software Trouble Shooting		
9.	Practice on different DOS and Unix commands. Basic configuration management of Windows operating system	2	CO5
10.	Practice on designing and preparing reports using word, Power-point and Excel applications	4	CO6

Learning Resources

1. Unix &DOS commands http://www.yolinux.com/TUTORIALS/unix_for_dos_users.html
2. MS-Office https://support.office.com/en-us/office-training-center
3. PC troubleshooting: http://h10032.www1.hp.com/ctg/Manual/c00772931.pdf

Course Designers

1. Dr. S. Sudha ssj@tce.edu

18ES290	LATERAL THINKING

Category	L	T	P	Credit
ES	0	0	2	1

Preamble

The purpose of thinking is to collect information and to make the best possible use of it. Vertical thinking is concerned with proving or developing concept patterns. Lateral thinking is concerned with restructuring such patterns (insight) and provoking new ones (creativity). Lateral and vertical thinking are complementary. Skill in both is necessary. Although the emphasis in education has always been exclusively on vertical thinking, the need for lateral thinking arises from the limitations of the behaviour of mind as a self-maximizing memory system. Lateral thinking can be learned, practised and used. It is possible to acquire skill in it just as it is possible to acquire skill in mathematics. The course provides formal opportunities to practise lateral thinking and also an explanation of the processes involved.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO #	Course Outcome Statement	Weightage in %
CO1	Explain the concept of lateral thinking, distinguish it from vertical thinking.	10
CO2	Use lateral thinking for problem solving	10
CO3	Generate Alternatives, challenge assumptions and suspend judgment and Practice lateral thinking in design process	20
CO4	Apply the concept of factorization and reversal method for restructuring	20
CO5	Organize brainstorming sessions	10
CO6	Use PO for innovation	10
CO7	Aware of limitation of established patterns and practice lateral thinking in small projects	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	-	2.3.1, 3.2.6
CO2	TPS3	Apply	Value	-	2.4.1, 2.4.2, 2.4.3
CO3	TPS3	Apply	Value	-	2.4.1, 2.4.2, 2.4.3, 2.4.5, 2.4.6
CO4	TPS3	Apply	Value	-	2.3.1, 2.4.2, 2.4.3
CO5	TPS4	Analyse	Organize	-	3.1.1, 3.1.2, 3.2.1, 3.2.2
CO6	TPS3	Apply	Value	-	2.1.4, 2.3.1, 2.4.1, 2.4.2, 2.4.3, 2.4.6
CO7	TPS5	Evaluate	Characterize	-	2.3.4, 4.5.1, 4.6.1

Mapping with Programme Outcomes and Programme Specific Outcomes

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	-	-	-	-	-	-	-	-	-	L
CO2	S	M	L	-	-	-	-	-	-	-	-	L

CO3	S	M	L	-	-	-	-	S	L	L	-	L
CO4	S	M	L	-	-	-	-	S	L	L	-	L
CO5	S	S	M	L	-	-	-	S	S	S	-	L
CO6	S	M	L	-	-	-	-					L
CO7	S	S	S	M	-	S	-	-	S	S	-	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Continuous Assessment

Worksheets (5)	:	20 Marks
Case Studies (3)	:	30 Marks

Terminal Examination

Ability Test	:	50 Marks
Case Study (Best) Presentation and Viva Voce	:	50 Marks

Syllabus

The way the mind works, Difference between lateral and vertical thinking, Attitudes towards lateral thinking, Basic nature of lateral thinking, The use of lateral thinking Techniques, The generation of alternatives, Challenging assumptions, Innovation, Suspended judgment, Design, Dominant ideas and crucial factors, Fractionation, The reversal method, Brainstorming, Analogies, Choice of entry point and attention area, Random stimulation, Concepts/divisions/polarization, The new word PO, Blocked by openness, Description/problem solving/design

Learning Resources

1. Edward de Bono, “Lateral Thinking: Creativity Step by Step”, Happer Collins Publisher, 1990.
2. Edward de Bono, “Six Thinking Hats”, Little Brown and Company Publisher, 1985.
3. Edward de Bono’s Thinking Course, Video Lecture, Weblink: https://www.yputube.com/watch?v=AUq_AL2LNEw

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	The way the mind works	1	CO1
1.1	Difference between lateral and vertical thinking	1	CO1
1.2	Attitudes towards lateral thinking	1	CO2
2.	Basic nature of lateral thinking	1	CO2
2.1	The use of lateral thinking techniques	1	CO2
2.2	The generation of alternatives	1	CO3
2.3	Challenging assumptions	1	CO3
2.4	Innovation	1	CO3
2.5	Suspended judgment	1	CO3
3.	Design	1	CO3
3.1	Dominant ideas and crucial factors	1	CO3
3.2	Fractionation	1	CO4
4.	The reversal method	1	CO4
4.1	Brainstorming	1	CO5
4.2	Analogies	1	CO5
4.3	Choice of entry point and attention area	1	CO5
4.4	Random stimulation	1	CO5

4.5	Concepts/divisions/polarization	1	CO5
4.6	The new word PO	2	CO6
5.	Blocked by openness	2	CO7
5.1	Description/problem solving/design	2	CO7

Course Designers:

1. S J. Thiruvengadam sjtece@tce.edu

18CHAA0	ENVIRONMENTAL SCIENCE

Category	L	T	P	Credit
ES	1	0	1	-

Preamble

The objective of this course is intended to make the students to understand the basic concepts of environment, ecology and pollution of the current environmental issues and to participate in various activities on conserving and protecting the environment.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome	Weightage*** in %
CO1	Describe the importance and progression of ecological system	15%
CO2	Explain the significance of natural resources	10%
CO3	Demonstrate the effects of pollution on environment and human beings	15%
CO4	Practice the suitable management method during disaster episode	10%
CO5	Explain the ethics and values related to Environment	15%
CO6	Describe the Traditional values and Impact of modernization on Environment	10%
CO7	Carry out group activities	25%

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.1,2.3.1,2.3.2,2.3.4
CO2	TPS2	Understand	Respond	Guided Response	1.1,2.3.1,2.3.2,2.3.4
CO3	TPS3	Apply	Value	Mechanism	1.1,2.1.1,2.1.5,2.4.1,4.1.2
CO4	TPS3	Apply	Value	Mechanism	1.1,2.4.1,2.4.7,4.1.1,4.1.2
CO5	TPS2	Understand	Respond	Guided Response	1.1,2.5.1,2.5.2,
CO6	TPS2	Understand	Respond	Guided Response	1.1,2.4.7,2.5.4,
CO7	TPS4	Analyse	Organise	Complex Overt Responses	3.1.1,3.1.2,3.1.3,3.1.4,4.1.1,4.1.2

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	-	-	-	-	L	S	-	-	-	-	-
CO2	M	-	-	-	-	L	-	L	-	-	-	-

CO3	M	M	-	-	L	M	S	-	-	-	-	-
CO4	M	-	L	L	L	M	M	-	-	-	-	-
CO5	L	-	-	-	-	-	-	M	-	-	-	-
CO6	L	L	-	-	-	-	M	-	-	-	-	-
CO7	S	M	M	M	M	M	-	-	S	M	M	-

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment#			Terminal Examination***
	1	2	3	1	2	3	
Remember	0	20	0	NA	NA	NA	Presentation on Case study report
Understand	0	40	0				
Apply	0	40	0				
Analyse	0	0	0				
Evaluate	0	0	0				
Create	0	0	0				

Assignment: Marks will be given for the review I, II & III of case study presentation.

*** Case study presentation and evaluation

- Each group comprise of maximum three students
- Students will submit the case study report similar to final year project report
- Evaluation of case study presentation is based on the approved rubrics

Method of Evaluation

a)Internal assessment

S.No	Description	Max.marks	Final conversion
1	CAT -II	50	40
2	Assignment marks (from Review I,II & III)	3 X 10 =30	10
		Total	50

b) End semester examination – Case study presentation

Performance Index	Marks per Individual
Originality of the work	20
Data collected	20
Suggestion to overcome for the identified issues	20
Final Presentation	40
Total	100

Model Titles for Case Study:

1. Environmental impacts of quarry industries in Melur Taluk.
2. A study on impacts of tanneries on ground water and soil quality in Dindigul district.
3. Effect of pharmaceutical industry on groundwater quality in poikaraipatty village, Alagar Kovil.
4. Solid waste and waste water management in TCE hostel.
5. Environmental effect of Kudankulam atomic power plant.
6. Case study on effect of Sterlite industry.

7. Effect on ground water and soil quality by dyeing industries in Tiruppur.
8. Effect of textile wastes in Karur District.
9. Segregation of waste and its recycling by Madurai Municipality at Vellakkal
10. Effect of fire work waste on atmosphere in Sivakasi region

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

1. Describe the Universal Energy flow model in an Ecosystem.
2. Discuss the conversion of one ecosystem into another ecosystem with example.
3. Explain the multidisciplinary nature of the environment.

Course Outcome 2 (CO2):

1. Summarize the importance of Natural resources to animals and human beings.
2. Describe the role of an individual in the conservation of Natural resources.

Course Outcome 3(CO3):

1. Demonstrate the effects and control measures of air pollution
2. Investigate the sources and management methods of e-waste.

Course Outcome 4(CO4):

1. Dramatize the mitigation methods adopted in severe cyclone affected areas.
2. Suggest the precautionary steps to prevent life from flood.

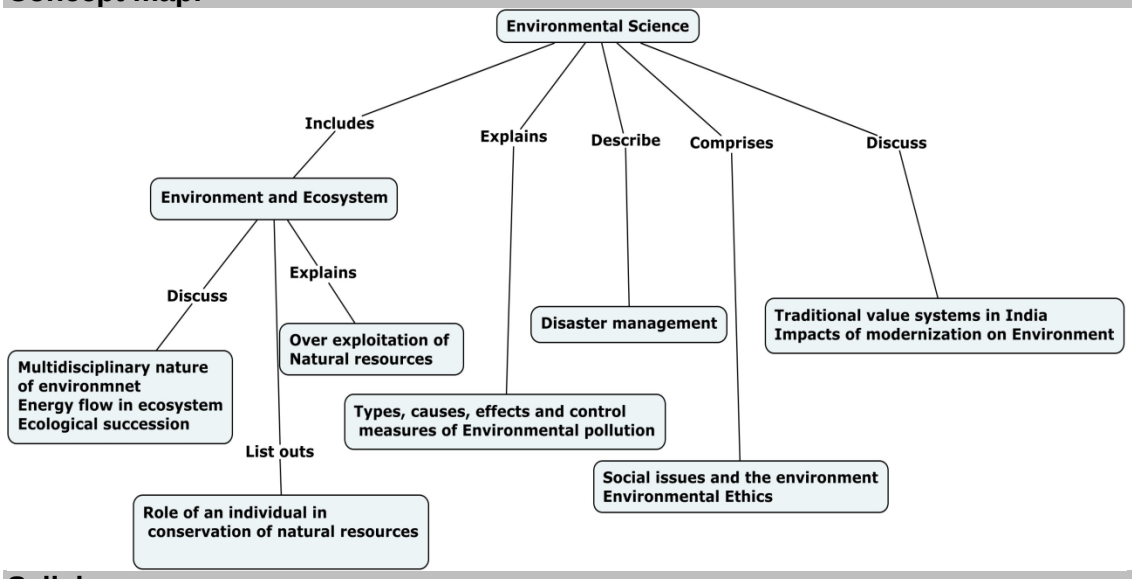
Course Outcome 5 (CO5):

1. Discuss the need for public awareness on environmental protection.
2. Identify the requirement for the equitable utilization of natural resources.

Course Outcome 6(CO6):

1. Describe the traditional value systems of India.
2. Recall the environmental related points discussed in our Indian Vedas.
3. List out the impacts of modernization on environment

Concept map:



Syllabus

Environment and Ecosystem - Multidisciplinary nature of environment- Ecosystem- Energy flow in ecosystem-Ecological succession-Over exploitation of Natural resources-Role of an individual in conservation of natural resources. **Environmental pollution and control -** Environmental pollution – types, causes, effects and control measures - Disaster management strategies. **Environmental Ethics and Values -** Social issues and the environment -need for

public awareness, Environmental Ethics- need for equitable utilization of natural resources- Traditional value systems in India, Impacts of modernization on Environment

Awareness and actual activities:

- ✓ Group meeting on water management, promotion of recycle use, reduction of waste,
- ✓ Plantation
- ✓ Cleanliness drive
- ✓ Drive on segregation of waste
- ✓ Energy saving
- ✓ Lectures by Environmentalist
- ✓ Slogan and poster making event

Learning Resources

1. Kaushik,A & Kaushik.C.P, Environmental Science and Engineering, 6th Edition, New Age International, 2018.
2. Erach Bharucha, Text book of Environmental studies for Undergraduate courses, 2nd Edtion, UGC, 2013.
3. Gilbert M.Masters, Introduction to Environmental Engineering and Sciences, 2nd Edition, Pearson , 2004.
4. Garg S.K & Garg, Ecological and Environmental studies, Khanna Publishrers, 2006.
5. Wright &Nebel, Environmental science towards a sustainable future, 8th Editon,Prentice Hall of Indial Ltd, 2002.
6. Documentary titled "HOME" by Yves Bertrand, Video Link: https://www.youtube.com/watch?v=jqxENMKaeCU

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.0	**Environment and Ecosystem**		
1.1	Multidisciplinary nature of environment-Ecosystem	1	CO1
1.2	Energy flow in ecosystem – Universal energy flow model	1	CO1
1.3	Ecological succession	1	CO1
1.4	Over exploitation of Natural resources	1	CO2
1.5	Role of individual in conservation of natural resources	1	CO2
2.0	**Environmental pollution and control**		
2.1	Environmental pollution – types(Air, Water,soil,Marine),	2	CO3
2.2	causes (gaseous, liquid, solid, plastic, e-waste, biomedical waste and radiations),	2	CO3
2.3	**E**ffects and control measures of Pollution	2	CO3
2.4	Disaster managements during cyclone, Tsunami, flood, draught and earthquake	2	CO4
3.0	**Environmental Ethics and Values**		
3.1	Social issues and the environment -need for public awareness	1	CO5
3.2	Environmental Ethics- need for equitable utilization of natural resources	1	CO5
3.3	Traditional value systems in India,	1	CO6
3.4	Impacts of modernization on Environment	2	CO6
4.0	**Awareness and actual activities**		
4.1	Group meeting on water management, promotion of recycle use, reduction of waste	2	CO7
4.2	Plantation	1	CO7
4.3	Cleanliness drive	1	CO7

4.4	Drive on segregation of waste	1	CO7
4.5	Energy saving	1	CO7
4.6	Lectures by Environmentalist	1	CO7
4.7	Slogan and poster making event	Through online	CO7

Course Designers:

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