UNIVERSITY OF JAMMU

NOTIFICATION

(19/Aug/Adp/28)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Bodies, has been pleased to authorize the adoption of revised Syllabus of **Bachelor of Engineering (Computer Engineering)** for Semester III & IV under the **Choice Based Credit System** as per the model curriculum of the **AICTE (as given in the Annexure)** for the candidates of **all (Govt./Pvt./UIET) Engineering Colleges affiliated with the University of Jammu** for the Examinations to be held in the years indicated against each Semester as under :-

Branch	Semester	For the Examination to be held in the years
Computer	**Semester-III**	**December 2019, 2020, 2021 and 2022**
	Semester-IV	**May 2020, 2021, 2022 and 2023**

The Syllabi of the course is available on the University Website: *www.jammuuniversity.in.*

Sd/-
DEAN ACADEMIC AFFAIRS

No. F.Acd/III/19/4745-4756
Dated 20/08/2019
Copy for information & necessary action to:-

1. Dean Faculty of Engineering
2. Principal, GCET/MIET/MBSCET/UIET/BCET/YCET
3. C.A to the Controller of Examinations
4. Assistant Registrar (Exams/Confidential)
5. Section Officer (Confidential)
6. Incharge University Website

Assistant Registrar (Academics)

19/8 19/8 19/08/19

ANNEXURE-1

B.E. Computer Engineering 3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

B.E. Computer Engineering 3rd Semester **Contact Hrs: 26**

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATION			MARKS DISTRIBUTION		TOTAL	Credits	% Change
			L	T	P	Internal	External			
PCS-301	Professional Core Course	Object Oriented Programming using C++	3	1	0	50	100	150	4	100%
PCS-302	Professional Core Course	PC Hardware& Maintenance	2	1	0	50	100	150	3	100%
EEC-301	Engineering Science Course	Analog Electronics	2	1	0	50	100	150	3	100%
BSC-302	Basic Science Course	Numerical Methods	2	1	0	25	75	100	3	100%
HMC-302	Humanities & Social Science Course	Entrepreneurship and Business Strategies	2	1	0	50	100	150	3	100%
PCS-311	Professional Core Course	Object Oriented Programming using C++ Lab	0	0	2	50	-	50	1	100%
PCS-312	Professional Core Course	PC Hardware& Maintenance Lab	0	0	2	50	-	50	1	100%
EEC-311	Engineering Science Course	Analog Electronics Lab	0	0	2	50	-	50	1	100%
PCS-313	Professional Core Course	Numerical Methods using C- Programming Lab	0	0	2	50	-	50	1	100%
MOC-314	Massive Open Online Course	MooC								100%
NCC-301	Non-Credit Course	Cyber Ethics & Laws	2	0	0	Satisfactory/ Un-Satisfactory			Non-Credit	100%
TOTAL			**13**	**5**	**8**	**425**	**475**	**900**	**20**	

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDITS: 4**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-301
COURSE TITLE: OBJECT ORIENTED PROGRAMMING USING C++
DURATION OF EXAM: 3 HOURS

L	T	P	Marks: Theory	Marks: Sessional
3	1	0	100	50

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Understand the difference between Structured Programming approach and Object Oriented Programming approach.
CO2	Acquire knowledge in developing object oriented solutions to problems by learning the usage of Data Abstraction, Encapsulation, and Inheritance.
CO3	Design and Implement programs using Classes and Objects.
CO4	Understand the concept of Inheritance, Polymorphism, Operator Overloading and Function Overloading.
CO5	Apply the concepts of Object Oriented Programming in Templates & Exception Handling, File related operations and in real-time application development.

Detailed Syllabus

Section- A

Review of Pointers: Passing parameters, Array of Pointers, Character Pointers. **(2 Hrs)**

Programming Techniques: Unstructured, Procedural, Modular. Introduction to Objects, Object & Cohesion **(3 Hrs)**
Overview of C++: Object Oriented programming, Encapsulation, Polymorphism, Inheritance, Console I/O, C++ Comments. **(3Hrs)**
Classes& Objects: Metaclass, Abstract class, Public and Private variables, Constructor and Destructor Functions, Constructors taking parameters, Object Pointers, In-Line Functions, Automatic Inlining, Friend Functions, This Pointer, New & Delete, Array of Objects. **(12Hrs)**

Section- B

Overloading: Function Overloading, Overloading Constructor Functions, Operator overloading, Overloading Binary and Unary Operators, Overloading Relational & Logical Operators. **(8Hrs)**
Inheritance: Using Protected Members, Multiple Inheritance, Virtual Base Classes, Introduction to Virtual Functions. **(6 Hrs)**
Templates & Exception Handling: Use of Templates, Function Templates, Class Templates, Handling Exception. **(4 Hrs)**
File Handling: I/O Basics, Ifstream, Ofstream, Fstream, Open(), Close(), EOF(), Binary I/O, Get(), Put(), Read(), Write(), Random Access, Seekg(), Seekp(), Tellg(), Tellp(). **(4 Hrs)**

BOOKS RECOMMENDED:

1. Programming in C++ — Balaguruswamy
2. C++ the Complete Reference — Herbert Schildt.
3. Mastering C++ — K.R. Venugopal& T. Ravishankar& Raj Kumar.
4. Turbo C++ — Robert Lafore.

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDITS: 3**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-302
COURSE TITLE: PC HARDWARE AND MAINTAINANCE
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand about the latest developments in PC Hardware & its Peripherals.
CO2	Know about memory devices and its implementation in PC.
CO3	Acquire knowledge about the significance of device drivers in PC.
CO4	Analyze PC Fault Detection, Correction & Maintenance.
CO5	Implement various tools for Virus scanning & PC diagnostics.

Detailed Syllabus

Section-A

Computer Assembling: – Introduction – Overview of Parts of PC, Cabinet, Motherboard- components, function and form factor, Types of Buses, Disk drives, Network Card – Interfaces,CPU Main Memory, IO peripherals. **(8 Hrs)**

BIOS and CMOS Setup:– Introduction – Features , Developers, Identification, Interrupts , BIOS Upgrade , Troubleshooting. Standard CMOS Setup, Power Management, Setup Password Settings, Auto Configuration, BIOS Optimization, Power On Self Test (POST) **(4 Hrs)**

Display Adapters and Device Drivers:–Introduction, Types of display adapters (VGA,SVGA) Accelerated Graphic Ports – 3D Cards , Device Drivers – IO drivers, Sound Drivers, LAN Drivers etc, Role of device drivers in a PC. **(6 Hrs)**

Section- B

PC Power Supplies:-SMPS- Types of SMPS, principle working, SMPS form factor, CVT, UPS- its types and working, criteria for selecting right UPS for PCs. **(6 Hrs)**

Preventive Maintenance :– Introduction ,Need ,Tools , Procedures – Active Hardware Maintenance ,Active Software Maintenance – Passive Maintenance Procedures ,Preventive Maintenance Schedule, Virus-types, Detection and Precaution. **(8 Hrs)**

Troubleshooting :– Introduction , Types of PC Faults , Solid Faults , Intermittent Faults , Developing Strategy,Diagnostic and Repair Tools – Diagnostic Software Tools , Diagnostic Hardware Tools. **(6 Hrs)**

BOOKS RECOMMENDED:-

1. IBM PC & Clones: Hardware, Troubleshooting & Maintenance — Govindarajalu.
2. Computer Installation & Troubleshooting — M. Radhakrishan & Dr. Balasubramanian
3. Computer Hardware Installation, Interfacing, Trouble shooting and Maintenance — K. L. James
4. A+ Guide to Managing & Maintaining Your PC — Jean Andrews

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDITS: 3**
BRANCH: COMPUTER ENGINEERING
COURSE NO: EEC-301
COURSE TITLE: ANALOG ELECTRONICS
DURATION OF EXAM: 3 HOURS

L	T	P	Marks: Theory	Marks: Sessional
2	1	0	100	50

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand the principles of semiconductor devices and their applications.
CO2	Understand the characteristics of transistors and perform analysis on DC and AC loadline.
CO3	Attain basic knowledge of FETs and MOSFETs.
CO4	Perform analysis of single stage and multistage amplifiers.
CO5	Learn the basics of h- parameters.

Detailed Syllabus

Section-A

Semiconductor Devices: PN junction diode, Volt-ampere characteristics, diode capacitance, static and dynamic resistances, Zener diode, tunnel diode, schottky diode, photodiode, LED-their characteristics and analysis, Half wave, full wave and bridge rectifier with necessary derivations, Voltage regulation, Capacitor filter, Inductor filter, LC filter, Bleeder resistor, numerical problems. **(11 Hrs)**

Transistors: Transistor and itscharacteristics in CE,CB,CC mode, Ebers-Moll model, generalized transistor equation, Base width modulation, types of biasing circuits, operating point and load line.

(10 Hrs)

Section-B

FET: Introduction, Construction and operation of JFET, Characteristics, JFET parameters and their relationship,MOSFET- depletion and enhancement type- characteristics and operation. **(8 Hrs)**

Amplifiers: Principle of operation and classification of amplifiers (Single stage and multistage amplifiers) analysis and frequency response of amplifiers, multistage amplifiers- LC, RC, DC and transformer coupled. **(9 Hrs)**

Hybrid Parameters: Introduction, Two port network, Determination of h-parameters, h-parameter equivalent circuit, hybrid model for CE, CB, CC configuration with necessary derivations. **(4 Hrs)**

BOOKS RECOMMENDED:

1. Integrated Electronics — Millman & Halkias
2. Basic Electronics — J.B Gupta
3. Electronics Devices — Bolystead

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDITS: 3**
BRANCH: COMPUTER ENGINEERING
COURSE NO: BSC-302
COURSE TITLE: NUMERICAL METHODS
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**75**	**25**

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Find out the exact real root of algebraic and transcendental equations.
CO2	Obtain the values of function at a given point within the given data by using certain method of Interpolation
CO3	Calculate the definite integral using some appropriate numerical methods.
CO4	Solve various differential equations using numerical methods

Detailed Syllabus

Section-A

Roots of algebraic equations: - Bisection methods, Secantmethods, Newton Raphson Method, Method for finding complex roots, Graeffe's Root squaring method, Regula Falsi method, iteration method. **(10 Hrs)**

Solution of simultaneous algebraic equations: - Partition method for linear system of equations, Power method for finding Eigen values, properties & bounds for Eigen values & Eigen vectors. **(10 Hrs)**

Section-B

Interpolation:- Newton's Forward, Backward & Divided difference interpolation, Central difference interpolation formula, Stirling's & Bessel's formula, Langrange's interpolation formula. **(6 Hrs)**

Numerical Differentiation &Integration:-Derivatives using Forward Difference Formula, Backward difference formula & Central difference formula, Numerical Integration using Trapezoidal Rule & Simpson's Rule. **(10 Hrs)**

Differential equations & their solutions: - Taylor's series method, Euler's method, Rangakutta method, Picard's method. **(4 Hrs)**

BOOKS RECOMMENDED:

1	Elementary Numerical Analysis	S.D. Conte & Carl De Boor., Macgraw hill
2	Numerical Method for Scientists & Engineers	M.R. Jain, S.R.K.Iynegar& R.K Jain.,WileyEastern
3	Elementary Numerical Methods	B.S.Grewal,KnannaPublishion
4	A textbook on complex analysis and Numerical methods	Bhopinder Singh, Kirti Publications.

NOTE: There will be eight questions of 15 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDITS: 3**
BRANCH: COMPUTER ENGINEERING
COURSE NO: HMC-302
COURSE TITLE: ENTREPRENEURSHIP & BUSINESS STRATEGIES
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand in detail entrepreneurial skills and hence may opt entrepreneurship as a career option.
CO2	Understand women/social entrepreneur & legal forms of industrial ownership.
CO3	Apply proper knowledge about lean startups, business pitching, project initiation, execution and implementation.
CO4	Start their own SSI unit with adequate knowledge of schemes and policies for entrepreneurship development.

Detailed Syllabus

Section- A

Entrepreneurship: Definition and Types of entrepreneurs; Qualities of an entrepreneur; factors affecting entrepreneurship; Role of an entrepreneur in economic development; Difference between entrepreneur and manager; Barriers to entrepreneurship. **(6 Hrs)**

New Generations of Entrepreneurship: Women Entrepreneur: Classification of Women Entrepreneur in India, Problems of Women Entrepreneur, steps for promoting women entrepreneurship; Social Entrepreneur: Problems and steps for promoting social entrepreneurship. **(6 Hrs)**

Legal Forms of Industrial Ownership: Sole Proprietorship, Partnership, Joint Stock Company (Features, Merits and Demerits); Introduction to business models **(5 Hrs)**

Section-B

Lean Startups: Introduction to lean startups, Business pitching: Definition, types and importance. **(5Hrs)**

Starting a New project/ Venture: Scanning the environment, product development and selection, project report preparation, project resourcing, project planning and scheduling using networking techniques of PERT/CPM (concepts only). **(7 Hrs)**

Small Scale Industries and policies for entrepreneurship development:
Definition of small scale industries; objectives. Role of SSI in economic Development of India. SSI registration, NOC from pollution Board; Machinery and equipment selection; Schemes and Policies for entrepreneurship development. **(6 Hrs)**

BOOKS RECOMMENDED:

1. Fundamentals of Entrepreneurship — H. Nandan.
2. Business model generation — Alexander Osterwalder &Yves Pigneur
3. Small scale industries and Entrepreneurship — Vasant Desai.
4. Management of small scale Industries — Vasant Desai.
5. Entrepreneurial Development — S S Khanka
6. Entrepreneur Revolution: How to Develop your Entrepreneurial Mindset and Start a Business that works — Daniel Priestley

NOTE: There shall be total eight questions, four from each section. Each question carries 20 marks. Five questions will have to be attempted, selecting at least two from each section. Use of calculator is allowed.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO.: PCS-311
COURSE TITLE: OBJECT ORIENTED PROGRAMMING USING C++ LAB

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Develop solutions for a range of problems using Objects and Classes.
CO2	Implement the concepts of Constructors, Destructors and Operator Overloading.
CO3	Apply fundamental algorithmic problems including Type Casting, Inheritance.
CO4	Implement the concepts of Run Time Polymorphism using Virtual Functions
CO5	Implement the concepts of Generic Programming, Templates, File Handling using C++.

Lab Experiments:

Experiment 1	Design and implement programs using Pointers.
Experiment 2	Design and implement programs using Classes and Objects.
Experiment 3	Design and implement programs using Constructors and Destructors.
Experiment 4	Design and implement programs using the concepts of Inheritance.
Experiment 5	Design and implement programs using Friend Function.
Experiment 6	Design and implement programs using New and Delete operator.
Experiment 7	Design and implement programs using the concepts of Overloading.
Experiment 8	Design and implement programs using the concepts of files.

NOTE: Additional Lab experiments/practicals will be performed based on the course contents requirements.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-312
COURSE TITLE: PC HARDWARE AND MAINTAINANCE LAB.

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Install, configure, optimize and upgrade the portable personal computer.
CO2	Perform routine maintenance and upgrade of the computer system.
CO3	Identify the existing configuration of the computers and peripherals.
CO4	Define input and output characteristics of different configurations of transistors.
CO5	Perform diagnostic procedures and troubleshooting techniques to personal computer.

Lab Experiments:

Experiment1	Study of keyboard- Mechanical Keyboard & Membrane Keyboards
Experiment 2	Study of Printers a)Dot-Matrix Printers b) Inkjet Printers
Experiment 3	Study of SMPS
Experiment 4	Assembling the Units of Computer
Experiment 5	Fault finding in the various units of Computer, Fault finding Codes & Beeps.
Experiment 6	Software loading at different platforms such DOS, Windows- 95/98/2000
Experiment 7	Use of Antivirus Software

NOTE: Additional Lab experiments/ practical's will be performed based on the course contents requirements.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO: EEC-311
COURSE TITLE: ANALOG ELECTRONICS LAB

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Plot forward and reverse characteristics of PN junction diode and Zener diode.
CO2	Fabricate half and full wave rectifiers and evaluate their performance parameters
CO3	Plot the characteristics of transistor for various configurations using trainer kit.
CO4	Plot the characteristics of FET using trainer kit.

Lab Experiments:

Experiment 1	Familiarization with various Electronic Components- resistors, capacitors, Transistors, diodes, IC, Transformers
Experiment 2	Diode characteristics (Forward and reverse)
Experiment 3	Diode as a Rectifier with capacitor filter(Half & Full Bridge)
Experiment 4	Zener diode characteristics & Zener diode as voltage regulator
Experiment 5	Characteristics of Tunnel Diode, LED's, photodiode.
Experiment 6	Characteristics of transistors in CB, CE & CC mode.
Experiment 7	Design of self bias circuit using BJT.
Experiment 8	Characteristics of JFET, MOSFET.
Experiment 9	Determination of h-parameters from transistor characteristics.

NOTE: Students should perform at least 7 out of 9 experiments.

NOTE: Additional Lab experiments/practicals will be performed based on the course contents requirements.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDITS: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO. PCS-313
COURSE TITLE: NUMERICAL METHODS USING C-PROGRAMMING LAB

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Implement Jordan Elimination Method using C.
CO2	Implement Newton-Raphson Method using C.
CO3	Implement Simpson's Rule using C.
CO4	Implement Gauss Elimination method using C.
CO5	Implement Newton's forward and backward interpolation using C.

Lab Experiments:

Experiment 1	Newton's Forward Interpolation formula
Experiment 2	Newton's Backward Interpolation formula
Experiment 3	Lagrange's Interpolation formula
Experiment 4	Trapezoidal Rule
Experiment 5	Simpson's Rule
Experiment 6	Newton-Raphson's Method
Experiment 7	Eular Method
Experiment 8	Jordan Elimination Method

NOTE: Additional Lab experiments/practicals will be performed based on the course contents requirements.

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO: MOC-314
COURSE TITLE: MooC

			Marks
L	**T**	**P**	**Practical**
0	**0**	**2**	**50**

MooC: A massive open online course (MooC) is a model for delivering learning content to any person who wants to take a course by means of the web. It has been incorporated in the 3rd semester. Here the students will have a choice to choose between Numerical Methods Lab and a MooC course.
To evaluate a MooCs course following is the scheme proposed:

Breakup of Marks:

- **Attendance- 10 marks**
  Students will have to visit the lab twice a week as per the time table and pursue their respective online course.
- **Report file-15 marks**
  A detailed report of about 20-25 pages has to be submitted to the department at the end of the semester. It should contain details about the course that was undertaken by the student. A copy of the assignments with solutions that have been uploaded on the MooC platform should also be included in the final report. A copy of the certificate if awarded should also be appended to the report.
- **Presentation- 15 marks.**
  The presentation should be given to the peers/students focusing on the key points of the course with an aim to share the knowledge.
- **Certification- 10 marks**
  The students awarded with the certificate will be given 10 marks. (Copy to be attached in the report.)

The students can opt for MooC from the list provided here under. The choice of course opted is not restricted to the list, provided the opted course is approved by the department.

1. C#
2. C Sharp
3. Web Development
4. Python
5. PHP
6. Mobile Computing
7. Android
8. Programming using MATLAB
9. JavaScript Basics
10. Client Server Communication
11. Web Security Fundamentals
12. SQL

3rd Semester Examination to be held in the Year December 2019, 2020, 2021, 2022

CLASS: B.E. 3RD SEMESTER **CREDITS: 0**
BRANCH: COMPUTER ENGINEERING
COURSE No: NCC-301
COURSE TITLE: CYBER ETHICS & LAWS

L	T	P	Marks
2	0	0	Theory
			Satisfactory/Unsatisfactory

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand the basic concepts of Cyber Ethics &Laws.
CO2	Understand about the constitutional and Human Rights Issues in Cyber space
CO3	Understand Cyber Crimes and Legal Framework
CO4	Understand about the limitations and current issues in the area.

Detailed Syllabus

Unit-I: Ethics in Cyber Space, Core Values and Virtues, Dimensions of Cyber Ethics in Cyber Society, Cyber Ethics by Norms, Laws and Relations, Principle & Significance of Cyber Ethics, Ethics in Information Society.

Unit-II: Computer and its impact in Society, Overview of Computer and Web Technology, what are Cyber Laws, Need for Cyber Laws, Cyber Jurisprudence at International and Indian Level

Unit-III: Objectives, Importance of Cyber Laws, Right to Access Cyberspace-Access to internet, Right to privacy, Right to data protection, Advantages and Disadvantages

Unit-IV: Cyber Crime against Individual, Institution and State, Types of Cyber Crimes, Cyber Crimes and Legal Framework

Unit-V: Limitations and Current Issues relating Cyber Ethics & Cyber Laws in the Society

BOOKS RECOMMENDED:

1. Cyber Laws — Justice Yatindra Singh
2. Cyber Laws and Crimes Simplified — Adv. Prasant Mali
3. Cyber Ethics 4.0 — Christoph Stuckelberger and Pavan Duggal

NOTE: This is a Mandatory Non-Credit Course. Two objective papers will be conducted internally by the department. The students are required to score at least 40% or above in totality to be considered qualified in the course.

ANNEXURE-1I

B.E Computer Engineering Fourth Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

B.E. Computer Engineering 4th Semester **Contact Hrs: 28**

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATION			MARKS DISTRIBUTION		TOTAL	Credits	% Change
			L	T	P	Internal	External			
BSC-401	Basic Science Course	Discrete Mathematics	2	1	0	50	100	150	3	100%
PCS-401	Professional Core Course	Data Structures	3	1	0	50	100	150	4	100%
PCS-402	Professional Core Course	RDBMS	3	1	0	50	100	150	4	100%
PCS-403	Professional Core Course	Computer Organization & Architecture	2	1	0	50	100	150	3	100%
PCS-404	Professional Core Course	Java Programming	2	1	0	50	100	150	3	100%
PCS-405	Professional Core Course	Digital Electronics	2	1	0	50	100	150	3	100%
PCS-411	Professional Core Course	Data Structures Lab	0	0	2	50	-	50	1	100%
PCS-412	Professional Core Course	RDBMS Lab	0	0	2	50	-	50	1	100%
PCS-414	Professional Core Course	Java Programming Lab	0	0	2	50	-	50	1	100%
PCS-415	Professional Core Course	Digital Electronics Lab	0	0	2	50	-	50	1	100%
TOTAL			**14**	**6**	**8**	**500**	**600**	**1100**	**24**	

4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

CLASS: B.E. 4TH SEMESTER **CREDITS: 3**
BRANCH: COMPUTER ENGINEERING
COURSE NO. BSC-401
COURSE TITLE: DISCRETE MATHEMATICS
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	Understand basic principles of sets and operations in sets.
CO2	Analyze relations and functions and be able to determine their properties.
CO3	Apply logical notation to describe an argument.
CO4	Evaluate the basics concepts of groups, its examples and related results.
CO5	Create graphs and trees using different transversal methods.

Detailed Syllabus

Section – A

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Finite and infinite sets, countable and uncountable sets, Binary Relation and its types, Functions and its types, Principles of Mathematical induction, Principle of inclusion and exclusion, pigeon-hole principle. **(12Hrs)**

Algebraic Structure: Groups and sub groups, related theorems, Cosets, Normal subgroups and Group homomorphism. Rings, Integral domains and fields: examples and related results. **(10 Hrs)**

Section – B

Graphs and Trees: Basic terminology, multi graphs and weighted graphs, connectivity, walk and path, circuits and cycles, shortest path in weighted graphs, Algorithm of shortest path. Hamiltonian and Eulerian paths and circuits, Eulerian graphs, Hamiltonian graphs, Konigsberg bridge problem, Chinese postman problem, Travelling salesperson problem, Planar graph and Euler's formula.
Trees and cutsets: Trees, rooted trees, path lengths in rooted trees, Spanning trees and cut sets. **(20 Hrs)**

BOOKS RECOMMENDED:

1. Discrete Mathematics and its Applications, Tata McGraw – Hill — Kenneth H. Rosen
2. Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc. — Susanna S. Epp
3. Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill — C L Liu and D P Mohapatra
4. Graph Theory — Narsingh Deo

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

CLASS: B.E. 4TH SEMESTER **CREDITS: 4**
BRANCH: COMPUTER ENGINEERING
COURSE NO. PCS-401
COURSE TITLE: DATA STRUCTURES
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
3	**1**	**0**	**100**	**50**

COURSE OUTCOMES **At the end of the course the student will be able to: -**	
CO1	For a given algorithm student will be able to analyze the algorithm to determine its Time and Space Complexity and to understand its relationship with Data Structures.
CO2	To understand basic concepts about Stacks, Queues, Lists, Trees and Graphs
CO3	To enable them to write algorithms for solving problems with the help of various fundamental Data Structures.
CO4	To understand and use different sorting and searching techniques and compare their performance in terms of Space and Time complexity

Detailed Syllabus

Section- A

Introduction to data structures: - Concepts of data and algorithm, Relation between Data Structure & Algorithm, Introduction to Time & Space complexity, Data types, Data Structures & Abstract data types, Representation of Arrays, Sparse matrices. **(2 Hrs)**

Stacks and Queues: - Concept of Stacks, Operation on Stacks, Multiple stacks, Application of stacks in Infix, Postfix, Prefix, Recursion, Concept of Queues, Operation on Queues, Multiple Queues, Priority Queues, Circular Queues. **(10Hrs)**

Linked Lists: - Insertion, Deletion and Traversal on Linear Linked Lists, Doubly Linked List, Circular Linked List, Linked List as Data Structure, Header nodes, Stacks & Queues using linked list, Dynamic memory management, Garbage Collection **(10Hrs)**

Section-B

Trees: -Binary trees and its representation using Linked list, Operations on Binary Trees, Traversal Algorithms, Applications, Threaded Binary Trees and its Traversal algorithms, Heterogeneous Binary Trees, List representation using Binary Trees, Optimum Search Trees, AVL trees. **(10Hrs)**

Graphs: -Representation of Graphs, Traversal methods, Applications Undirected Graphs, Directed Graph& their Traversal, Depth first, Breadth First, Shortest Path algorithms (Dijkstra and Floyd), Minimum Cost Spanning tree (Prim and Kruskal). **(8Hrs)**

Sorting &Searching:-

1. Exchange Sort (Bubble, Quicksort)
2. Selection & Tree Sorting.
3. Insertion sort, Shell Sort, Address Calculation Sort
4. Merge & Radix Sort.
5. Sequential Searching, searching an Ordered Table, Index sequential search, Binary search, Interpolation search, Tree searching. **(5Hrs)**

BOOKS RECOMMENDED:

1	Data Structure using C	Tenenbaum, Langsam, Augenstein
2	Fundamentals of data structures	Horowiz E. and Sahni S.
3	Data structures and Program Design	Robert L. Kruse.
4	Data Structures & Algorithm	Aho, Hopcraft and Ullman.
5	Data Structure with Applications	Sorenson.

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

CLASS: B.E. 4TH SEMESTER **CREDITS: 4**
BRANCH: COMPUTER ENGINEERING
COURSE NO. PCS-402
COURSE TITLE: RDBMS
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
3	**1**	**0**	**100**	**50**

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand DBMS architecture, Physical and Logical Database Designs, Database Modeling, Relational, Hierarchical and Network Models.
CO2	Identify basic database storage structures and access techniques such as file organizations, indexing methods.
CO3	Apply Structured query language (SQL) for database definition and database manipulation.
CO4	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
CO5	Write application programs dealing with issues like concurrency control and database protection mechanisms.

Detailed Syllabus

Section-A

Basic Concepts: - Data Modeling-Records and Files-Abstraction and data Integration-Views-Data Independence-Components of DBMS-Advantages and Disadvantages, Data Associations, Data Models Classification. **(4 Hrs)**

Entity Relationship Model: Basic concepts, constraints, design issues, Entity Relationship diagram, Week Entity sets, Extended ER features, Design of ER database schema, Reduction of ER schema to tables. **(6Hrs)**

Relational Model:- Attributes and domains, Tuples, Relations and Schemas, Relation representation, keys, Integrity Rules, Relational algebra, Relational Calculus, Data Manipulation using SQL. **(8 Hrs)**

Relational Data-base Design:-Normalization using Functional Dependency, Normalization using Join dependencies, Normalization using Join Dependencies, Domain key normal form. **(6 Hrs)**

Section-B

Transactions: Transaction concept, transaction state, implementation of Atomicity and Durability, Concurrent executions, Serializability, Recoverability, implementation of isolation, transaction definition in SQL. **(8 Hrs)**

Concurrency Control: Lock based protocols, Timestamp based protocols, Validation based protocols, Multiple Granularity, Multiversion Schemes, Deadlock Handling, Inset and Delete operations **(6 Hrs)**

Recovery Systems: Failure classification, Storage Structure, Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with Concurrent Transitions, Buffer Management. **(4 Hrs)**

BOOKS RECOMMENDED:

1. Database System Concepts — Korth,Silberchatz–TMH
2. An introduction to Database Systems — Bipin C. Desai
3. Principles of Data Base Management Systems — Aho Ullman
4. Oracle — Ivan Bayross.

NOTE:There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

4th Semester Examination to be held in the Year May 2020,2021,2022,2023

CLASS: B. E 4TH SEMESTER **CREDIT: 3**
BRANCH: COMPUTER ENGINEERING
COURSE NO. PCS-403
COURSE TITLE: COMPUTER ORGANISATION AND ARCHITECTURE.
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand the basic architecture and operational concepts in designing CPU.
CO2	Analyze various component units (ALU & CU) and Organization of CPU.
CO3	Analyze various memories management techniques like Virtual Memory and Cache Memory.
CO4	Apply the concepts of Parallel Processing in designing high performance processors
CO5	Analyze the working of different types of Processors

Detailed Syllabus

Section-A

Introduction: - Basic structure of Computers, stored programme concept, Basic Operational concepts, Functional Units, Machine language, concept of memory locations, addresses, addressing modes. **(6 Hrs)**

Processing and execution: - Processing unit, execution of instructions, control step sequence, different types of instruction, ALU Design, Arithmetic Processes, Control Unit Design, Hardwired & Micro programmed Control Unit. **(6 Hrs)**

CPU: General Register Organization, Stack Organization, Instruction format, RISC, CISC. **(4Hrs)**

Input output organization: - I/O Systems–Programmed Control, Interrupt controlled &DMAData Transfer Schemes, I/O Processors. Architecture(IOP). **(6 Hrs)**

Section-B

Memory Management: - Memory organization, Characteristics of memory size, Access time, Read/write cycle time, Sequential and Random access semiconductor memories, Virtual memory and its implementation, Cache memory and its types- Split and Unified, levels of Caches. **(8Hrs)**

Parallel processing – Basic Concepts, Types of parallel Processors, Pipelined processors, Pipelined Structures, Pipeline Hazards. **(6 Hrs)**

Introduction to Vector Processors, Array Processors, Multicore processors. **(6 Hrs)**

BOOKS RECOMMENDED:

1. Computer Architecture &Organization — John P. Hayes (Mc Graw Hill)
2. Computer System Architecture — Morris Mano
3. Computer System Architecture — V.K. Jain
3. Computer Organization — Carl V. Hamacher.
4. Digital Electronic — Malvino Brown.

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

4th Semester Examination to be held in the Year May 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER **CREDIT-3**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-404
COURSE TITLE: JAVA PROGRAMMING
DURATION OF EXAM: 3 HOURS

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand the concepts of Object-Oriented Programming paradigm and platform portability in Java.
CO2	Apply concepts of Classes, Objects and Methods to tackle real world problems.
CO3	Analyze errors and exceptions by using Exception Handling mechanism.
CO4	Examine the Multithreading techniques by extending Thread class and develop interface, Applets and Web pages
CO5	Create Graphic User Interface using Abstract Window Toolkit

Detailed Syllabus

Section – A

Java Evolution, And Overview of Java Language: Java History–Features of java, how java different from C and C++, Java and World Wide Web, Web Browser. Java Environment: Java Development kit (JDK), Application Programming Interface (API). Java Programming Structure, Java Tokens, Constants, Variables, Expressions, Decision Making Statements and Looping, Java Statements, Overview of Arrays and Strings, Machine Neutral, Java Virtual Machine (JVM), Command Line Arguments. **(6 Hrs)**

Arrays and Strings: Arrays, One-Dimensional arrays, Creating an Array, declaration of arrays, initialization of arrays, Two-Dimensional arrays, String arrays, String methods, String Buffer class, Vectors, Wrapper classes. **(4 Hrs)**

Classes, Objects and Methods: Introduction, defining a class, creating objects, accessing class members, constructors, methods overloading, static members. **(4 Hrs)**

Inheritance: Defining a sub class, sub class constructor, multilevel variables, Final classes, and Finalize methods, Abstract methods and classes, visibility control. **(4 Hrs)**

Managing Errors andExceptions: Introduction, Types of Errors-Compile time and Run time errors, Exceptions, Types of Exceptions, Syntax of Exception handling code, Multiple catch statements, using finally statement, Throwing our own exceptions. **(4 Hrs)**

Section- B

Multithreaded Programming: Introduction to threads, Creating Threads, Extending the Thread Class, Implementing the Runnable interface, life cycle of a thread, priority of a thread, synchronization, Deadlock. **(6Hrs)**

Interfaces and Applet Programming: Introduction, defining interfaces, extending interfaces, implementing interfaces. Introduction, how applet differ from applications, building applet code, applet life cycle, About HTML, designing a web page, passing parameters to applets**,**getting input from the User. **(6Hrs)**

Graphics Programming: Introduction, the Abstract Windowing Toolkit (AWT), frames, event-driven programming, layout managers, panels, canvasses, drawing geometric figures. Creating User Interface: Introduction, describe various user interface Components: button, label, text field, text area, choice, list, check box check box group. **(8Hrs)**

BOOKS RECOMMENDED:

1 Programming with JAVA — Balagurusamy TMH
2 An Introduction to JAVA Programming — Y.DanielLiangTMH
3 The Complete Reference JAVA 2 — Herbert Schield TMH

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

4th Semester Examination to be held in the Year May 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER **CREDITS: 3**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-405
COURSE TITLE: DIGITAL ELECTRONICS
DURATION OF EXAM: 3 HOURS

L	T	P	Marks: Theory	Marks: Sessional
2	1	0	100	50

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Understand the basics of number systems, logic Gates, Boolean laws & theorems.
CO2	Apply methods to simplify the Boolean functions to the minimum number of literals.
CO3	Design different types of combinational logic circuits using Logic gates.
CO4	Implement different types of sequential logic circuits using Flip Flops.
CO5	Construct different types of Counters and registers.

Detailed Syllabus

Section A

Digital Systems and Binary Numbers
Binary numbers, Number –Base Conversions, Arithmetic operations using number system, Data Representation - fixed and floating, Complements (1's and 2's), Binary codes – weighted/non-weighted codes, BCD codes, Excess-3-code, Grey codes, Conversion between codes, Code convertors Codes for error detection and correction (Hamming code). **(12 Hrs)**

Boolean algebra and Logic Simplification:
Boolean Algebra, Logical gates, Simplification of Boolean function using Boolean algebra, Karnaugh map (up to five variables), Quine Mcclusky Methods, Combinational Logic design -Half and Full adders, Half and full Subtractor, BCD Adder, Comparators. **(11Hrs)**

Section- B

Combinational circuits: Decoders, Encoders, Multiplexers, De-Multiplexers, Programmed logic devices–Read only memory, Programmable Read only Memories (PROM) and Programmable Logic Arrays (PLA), Programmable Array Logic (PAL). **(10Hrs)**

Sequential logic design: Latches and Flip flops, conversion between flip flops, Shift Registers, Analysis of synchronous and asynchronous counters, Design of Sequential logic circuits, State Reduction and Assignment, ASM Charts. **(10Hrs)**

BOOKS RECOMMENDED:

1	Digital Design	Morris Mano
2	Digital Electronics	R.P Jain
3	Digital Logic Design	J.P. Hayes
4	Digital Logic Design	Brain Holdsworth
5	Digital Electronics & Circuits Design	Thomas Mac calla
6	Digital Electronics	R.K Gour

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

4th Semester Examination to be held in the Year May 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-411
COURSE TITLE: DATA STRUCTURES LAB

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Implement basic operations on Stacks,Queues, Linked list, Trees and Graphs
CO2	Able to use various Data Structures in Problem Solving.
CO3	Implement various sorting and searching techniques.

Lab Experiments:

Experiment 1	Write a program to check if expression is correctly parenthesized using Stacks
Experiment 2	Write a program to evaluate Postfix Expressionusing Stacks
Experiment 3	Write a program to convert Infix Expression to its corresponding Postfix andPrefix
Experiment 4	Write a program to convert Prefix Expression to Postfix
Experiment 5	Write a program to implement Circular Queue Operations
Experiment 6	Write a program to implement Priority Queue Operations
Experiment 7	Write a program to implement Ordered Linked List
Experiment 8	Write a program to add Polynomials using Single Linked List
Experiment 9	Write a program to implement operations on Doubly Linked List
Experiment 10	Write a program to find the duplicate numbers in a given list using Binary Tree
Experiment 11	Write a program to Sort a list of numbers using Binary Search Tree
Experiment 12	Write a program to implement operations on Threaded Binary Trees
Experiment 13	Write a program to implement QuickSort algorithm
Experiment 14	Write a program to implement ShellSort algorithm
Experiment 15	Write a program to implement Merge Sort algorithm

NOTE: Additional Lab experiments/practical's will be performed based on the course contents requirements.

4th Semester Examination to be held in the Year May 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-412
COURSE TITLE: RDBMS LAB.

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Code and implement queries regarding basic DDL,DML and DCL commands.
CO2	Use Aggregate and group functions to summarize data
CO3	Join multiple tables using different types of joins.
CO4	Analyze the PL/SQL architecture and write PL/SQL code for procedures, triggers, cursors, exception handling etc.

Lab Experiments:

Experiment 1	To create , insert and show the basic structure of a table emp with following specifications: Attribute:-emp_code (int), emp_name(varchar(50)), design(varchar), doj(date), basic_sal(int), dept_code(int).
Experiment 2	To show all entries of emp_name from table emp having and not having desig = admin and emp_code = 102.
Experiment 3	To show all design entries from table emp that are unique.
Experiment 4	To show all entries of emp_name from table emp having 'A' in them
Experiment 5	To show all entries of emp_name, basic_sal from table emp and show by computing pf = basic_sal * 0.1, hra = basic_sal * 0.1, da = basic_sal * 0.1 and gross = basic_sal + da + hra – pf for all values of basic_sal.
Experiment 6	To display the count value of emp_code and find average of basic _sal for each dept_code. count the value of emp_code for each dept_code and ordered by count emp_code.
Experiment 7	To display the emp_code, emp_name, desig, basic_sal from emp having basic_sal<= 9000 and design is sales.
Experiment 8	To show all entries of emp_name from table emp where emp_code is either of 102, 104, 105, 107 and 108. doj is between 01-jan-05 and 31-dec-12.
Experiment 9	To calculate the average, maximum and minimum of all entries of basic_sal.
Experiment 10	To add 200 to all values of basic_sal where desig is sales.
Experiment 11	To display all values of basic_sal and basic_sal2 from table emp

NOTE: Additional Lab experiments/practicals will be performed based on the course contents requirements.

4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

CLASS: B.E. 4TH SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-414
COURSE TITLE: JAVA PROGRAMMING LAB.

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Understand various Java Tokens, Constants, Variables, Expressions, Decision Making and Looping Statements in java.
CO2	Implement the concepts for creating Arrays and Strings objects in java.
CO3	Implement the concept of constructor, Destructor, Static members method overloading and multithreading in java.
CO4	Manage Errors and Exceptions using Exception handling mechanism and code to implement interfaces and applets.
CO5	Design window frame using various GUI components like Buttons, Text fields, menu, check list and check boxes.

Lab Experiments:

Experiment 1	WAP To use different arithmetic operation in java.
Experiment 2	WAP To demonstrate wrapper class in java.
Experiment 3	WAP to perform manipulation on strings in java.
Experiment 4	WAP to demonstrate single inheritance in java.
Experiment 5	WAP to demonstrate multiple inheritance using interface in java
Experiment 6	WAP to demonstrate Exception handling in java
Experiment 7	WAP to check whether the entered amount is is sufficient or not ,if not raise an exception in java
Experiment 8	WAP to demonstrate threads in java.
Experiment 9	WAP to demonstrate APPLET in java.
Experiment 10	WAP to demonstrate event handling in java.

NOTE: Additional Lab experiments/practicals will be performed based on the course contents requirements.

4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

CLASS: B.E. 4TH SEMESTER **CREDIT: 1**
BRANCH: COMPUTER ENGINEERING
COURSE NO: PCS-415
COURSE TITLE: DIGITAL ELECTRONICS LAB.

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES **After Completion of this course the student will be able to: -**	
CO1	Implement logic gates and realization of OR, AND, NOT AND XOR Functions using universal gates.
CO2	Design and implement combinational circuits like half adder/full adder, half subtractor/full subtraction, code converters, comparators, MUX/DEMUX.
CO3	Design and implement sequential circuits like flip-flops, counters and shift registers.

Lab Experiments:

Experiment 1	Verification of truth table of basic gates.
Experiment 2	Verification of truth tables of ADDER/SUBTRACTER using IC-7483
Experiment 3	Verification of truth tables of MULTIPLEXER/DEMULTIPLEXER
Experiment 4	Verification of truth tables of BCD –7- Segment Display
Experiment 5	Verification of truth tables of Code Conversion.
Experiment 6	Design of Flip-Flops using IC chips
Experiment 7	Design of Two's complement circuits using shift registers
Experiment 8	Design and Implementation of Asynchronous MOD-12 counters.
Experiment 9	Design of a sequential circuit
Experiment 10	Study of PLA'S and PAL's.

NOTE: Each student has to perform at least 8 experiments out of which 40% shall be simulation based.

NOTE: Additional Lab experiments/practicals will be performed based on the course contents requirements.