JIS College of Engineering
Department of Information Technology
Curriculum of B.Tech in Information Technology
(Applicable for 2018 Admission Batch onwards)

1st Semester

Sl No	Paper Category	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	BS	M101	Mathematics -I	3	1	0	4	4
2	BS	PH101	Physics - I	3	0	0	3	3
3	ES	EC101	Basic Electronics Engineering	3	0	0	3	3
4	HS	HU101	English	2	0	0	2	2
Total of Theory							**12**	**12**
B. PRACTICAL								
5	BS	PH191	Physics-I Lab	0	0	3	3	1.5
6	ES	EC191	Basic Electronics Engineering Lab	0	0	3	3	1.5
7	ES	ME192	Workshop/Manufacturing Practices	0	0	3	3	1.5
Total of Practical							**9**	**4.5**
C. SESSIONAL								
8	MC	XC181	Extra Curricular Activity (NCC/NSS)	0	0	0	0	2 units

D. PROJECT*				
9	**Project Code**	**Project Name**	**Contact Hours /Week**	**Credit Points**
	M151	Mathematics –I Project	1	0.5
	PH151	Physics – I Project	1	0.5
	EC151	Basic Electronics Engineering Project	1	0.5
	HU151	English Project	1	0.5
***Total of Project** (Student would select any two projects (Total Credit: 0.5*2=1))			**2**	**1**
Total of Theory, Practical, Sessional and Project			**23**	**17.5**

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2nd Semester

Sl No	Paper Category	Paper Code	Theory	Contact Hours /Week L	T	P	Total	Credit Points
A. THEORY								
1	BS	M201	Mathematics -II	3	1	0	4	4
2	BS	CH201	Chemistry-I	3	0	0	3	3
3	ES	EE201	Basic Electrical Engineering	3	0	0	3	3
4	ES	CS201	Programming for Problem Solving	3	0	0	3	3
5	ES	ME201	Engineering Mechanics	3	0	0	3	3
Total of Theory							**16**	**16**
B. PRACTICAL								
6	ES	CS291	Programming for Problem Solving Lab	0	0	3	3	1.5
7	BS	CH291	Chemistry-I Lab	0	0	3	3	1.5
8	ES	EE291	Basic Electrical Engineering Lab	0	0	3	3	1.5
9	ES	ME191	Engineering Graphics & Design	0	0	3	3	1.5
10	HS	HU 291	Language Lab and Seminar Presentation	0	0	2	2	1
Total of Practical							**14**	**7**
C. SESSIONAL								
11	MC	XC281	Extra Curricular Activity	0	0	0	0	2 units
D. PROJECT*								
12	**Project Code**		**Project Name**	**Contact Hours /Week**				**Credit Points**
	M251		Mathematics –II Project	1				0.5
	CH251		Chemistry-I Project	1				0.5
	EE251		Basic Electrical Engineering Project	1				0.5
	CS251		Programming for Problem Solving Project	1				0.5
	ME251		Engineering Mechanics Project	1				0.5
***Total of Project** (Student would select any two projects (Total Credit: 0.5*2=1))				**2**				**1**
Total of Theory, Practical, Sessional and Project				**32**				**24**

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<table>
<tr><th colspan="9">3rd Semester</th></tr>
<tr><th rowspan="2">Sl No</th><th rowspan="2">Paper Category</th><th rowspan="2">Paper Code</th><th rowspan="2">Theory</th><th colspan="4">Contact Hours /Week</th><th>Credit Points</th></tr>
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<tr><th colspan="9">A. THEORY</th></tr>
<tr><td>1</td><td>PC</td><td>IT301</td><td>Data Structure and Algorithm</td><td>3</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
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<tr><th colspan="9">B. PRACTICAL</th></tr>
<tr><td>6</td><td>PC</td><td>IT391</td><td>Data Structure Lab</td><td>0</td><td>0</td><td>3</td><td>3</td><td>1.5</td></tr>
<tr><td>7</td><td>BS</td><td>M(IT)392</td><td>Numerical Methods and Statistics Lab</td><td>0</td><td>0</td><td>3</td><td>3</td><td>1.5</td></tr>
<tr><td>8</td><td>BS</td><td>PH391</td><td>Physics-II Lab</td><td>0</td><td>0</td><td>3</td><td>3</td><td>1.5</td></tr>
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<tr><th colspan="9">C. SESSIONAL</th></tr>
<tr><td>10</td><td>HS</td><td>HU381</td><td>Technical Report Writing & Language Practice</td><td>0</td><td>0</td><td>3</td><td>3</td><td>1.5</td></tr>
<tr><th colspan="9">D. PROJECT*</th></tr>
<tr><td rowspan="6">11</td><th colspan="2">Project Code</th><th>Project Name</th><th colspan="4">Contact Hours /Week</th><th>Credit Points</th></tr>
<tr><td colspan="2">IT351</td><td>Data Structure and Algorithm Project</td><td colspan="4">1</td><td>0.5</td></tr>
<tr><td colspan="2">M(IT)351</td><td>Mathematics –III Project</td><td colspan="4">1</td><td>0.5</td></tr>
<tr><td colspan="2">M(IT)352</td><td>Numerical Methods and Statistics Project</td><td colspan="4">1</td><td>0.5</td></tr>
<tr><td colspan="2">PH351</td><td>Physics-II Project</td><td colspan="4">1</td><td>0.5</td></tr>
<tr><td colspan="2">EC(IT)353</td><td>Analog and Digital Electronics Project</td><td colspan="4">1</td><td>0.5</td></tr>
<tr><td colspan="4">*Total of Project (Student would select any four projects (Total Credit: 0.5*4=2))</td><td colspan="4">4</td><td>2</td></tr>
<tr><td colspan="4">Total no. of Theory Practical, Sessional and Project</td><td colspan="4">34</td><td>24.5</td></tr>
</table>

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4th Semester

Sl No	Paper Category	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	IT401	Computer Organization & Architecture	3	0	0	3	3
2	ES	IT402	Communication Engineering & Coding Theory	3	0	0	3	3
3	PC	IT403	Formal Language And Automata Theory	3	0	0	3	3
4	PC	IT404	Object Oriented Programming using Java	3	0	0	3	3
Total no. of Theory							**12**	**12**
B.PRACTICAL								
5	PC	IT491	Computer Organization & Architecture Lab	0	0	3	3	1.5
6	ES	IT492	Communication Engineering & Coding Theory Lab	0	0	3	3	1.5
7	PC	IT494	Object Oriented Programming Lab	0	0	3	3	1.5
Total no. of Practical							**9**	**4.5**
C.SESSIONAL								
8	MC	XC401	Environmental Science	0	0	3	3	2 units
9	MC	MC481	Technical Skill Development	0	0	3	3	2 units

D. PROJECT*

Sl No	Project Code	Project Name	Contact Hours /Week	Credit Points
10	IT451	Computer Organization & Architecture Project	1	0.5
	IT452	Communication Engineering & Coding Theory Project	1	0.5
	IT453	Formal Language And Automata Theory Project	1	0.5
	IT454	Object Oriented Programming using Java Project	1	0.5
***Total of Project** (Student would select four projects (Total Credit: 0.5*4=2))			**4**	**2**
Total no. of Theory Practical, Sessional and Project			**31**	**18.5**

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Sl No	Paper Category	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
5th Semester								
A. THEORY								
1	PC	IT501	Design & Analysis of Algorithm	3	0	0	3	3
2	PC	IT502	Software Engineering	3	0	0	3	3
3	PC	IT503	Operating System	3	0	0	3	3
4	PE	IT504A IT504B IT504C	Programming practice with C++ Artificial Intelligence Operations Research	3	0	0	3	3
5	HS	HU505	Industrial & Financial Management	3	0	0	3	3
Total no. of Theory							**15**	**15**
B. PRACTICAL								
6	PC	IT591	Algorithm Lab	0	0	3	3	1.5
7	PC	IT592	Software Engineering Lab	0	0	3	3	1.5
8	PC	IT593	Operating System Lab	0	0	3	3	1.5
9	PE	IT594A IT 594B IT 594C	Programming practice with C++ Lab Artificial Intelligence Lab Operations Research Lab	0	0	3	3	1.5
Total no. of Practical							**12**	**6**
C. SESSIONAL								
10	PW	IT581	Mini Project - I	0	0	3	3	**2**
D. PROJECT*								
11	**Project Code**		**Project Name**	**Contact Hours /Week**				**Credit Points**
	IT551		Design & Analysis of Algorithm Project	1				0.5
	IT552		Software Engineering Project	1				0.5
	IT553		Operating System Project	1				0.5
	IT554A IT554B IT554C		Programming practice with C++ Project Artificial Intelligence Project Operations Research Project	1				0.5
	HU555		Industrial & Financial Management Project	1				0.5
***Total of Project** (Student would select any four projects (Total Credit: 0.5*4=2))				**4**				**2**
Total no. of Theory Practical, Sessional and Project				**34**				**25**

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6th Semester

Sl No	Paper Category	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
			A. THEORY					
1	PC	IT601	Database Management System	3	0	0	3	3
2	PC	IT602	Web Technology	3	0	0	3	3
3	PC	IT603	Computer Networking	3	0	0	3	3
4	PE	IT604A IT604B IT604C IT604D	ERP Compiler Design Digital Image Processing Soft Computing	3	0	0	3	3
5	OE	ECE(IT)605A CSE(IT)605B ECE(IT)605C HS(IT)605D EE(IT)605E	Digital Signal Processing Microprocessor Microcontroller Information and Coding Theory Project Management Control System	3	0	0	3	3
Total no. of Theory							**15**	**15**
			B. PRACTICAL					
6	PC	IT691	Database System Lab	0	0	3	3	1.5
7	PC	IT692	Web Technology Lab	0	0	3	3	1.5
8	PC	IT693	Computer Networking Lab	0	0	3	3	1.5
Total no. of Practical							**9**	**4.5**
			C. SESSIONAL					
9	PW	IT682	Mini Project - II	0	0	3	3	2
10	MC	MC681	Seminar/GD/ Presentation Skill/ Foreign Language	0	0	3	3	2 units

D. PROJECT*

Sl No	Project Code	Project Name	Contact Hours /Week	Credit Points
11	IT651	Database Management System Project	1	0.5
	IT652	Web Technology Project	1	0.5
	IT653	Computer Networking Project	1	0.5
	IT654A IT654B IT654C IT654D	ERP Project Compiler Design Project Digital Image Processing Project Soft Computing Project	1	0.5
	ECE(IT)655A CSE(IT)655B ECE(IT)655C HS(IT)655D EE(IT)655E	Digital Signal Processing Project Microprocessor Microcontroller Project Information and Coding Theory Project Project Management Project Control System Project	1	0.5
***Total of Project** (Student would select any four projects (Total Credit: 0.5*4=2))			**4**	**2**
Total no. of Theory Practical, Sessional and Project			**34**	**23.5**

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7th Semester								
Sl No	**Paper Category**	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
1	PC	IT701	E-Commerce	3	0	0	3	3
2	PE	IT702A IT702B IT702C IT702D	Computer Graphics and Multimedia Pattern Recognition Internet Technology Wireless Networking	3	0	0	3	3
3	PE	IT703A IT703B IT703C IT703D	Cloud Computing Distributed System Data Warehousing and Data Mining Advanced Computer Architecture	3	0	0	3	3
4	OE	CSE(IT)704A ECE(IT)704B CSE(IT)704C ECE(IT)704D	Modeling and Simulation Microelectronics and VLSI Design Natural Language Processing Mobile Communication	3	0	0	3	3
Total no. of Theory							**12**	**12**
B. PRACTICAL								
5	PC	IT791	E-Commerce Lab	0	0	3	3	1.5
6	PC	IT792	System Engineering Lab	0	0	3	3	1.5
Total no. of Practical							**6**	**3**
C. SESSIONAL								
7	PW	IT781	Industrial Training	0	0	0	4 weeks	2
8	PW	IT782	Project I	0	0	6	6	4
9	MC	IT783	Seminar/GD/ Presentation Skill/ Foreign Language	0	0	3	3	2 units
Total no. of Theory Practical and Sessional							**27**	**21**

8th Semester								
Sl No	**Paper Category**	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
A. **THEORY**								
1	PE	IT801A IT801B IT801C IT801D	Cryptography and Network Security Business Analytics Internet of Things Data Science	3	0	0	3	3
2	OE	BME(IT)802A ECE(IT)802B HS(IT)802C CSE(IT)802D	Bio-Informatics Embedded System Cyber Law and Security Policy Cluster and Grid Computing	3	0	0	3	3
3	HS	HU802	Value and Ethics in Professions	2	0	0	2	2
Total no. of Theory							**8**	**8**
B. PRACTICAL								
C. SESSIONAL								
4	PW	IT881	Design Lab/ Industrial problem related practical training	0	0	3	3	2
5	PW	IT882	Project II	0	0	12	12	6
6	PW	IT883	Grand Viva	0	0	0	0	3
Total no. of Theory Practical and Sessional							**23**	**19**

Total Credit: 19

Mandatory Total Credit: 163 (4 years UG) +10 (Project Based Learning)

[** For B.Tech. With Honours Degree, additional 10 Credit Point is to be earned (1st Sem to 8th Sem) through MOOCs courses.]

Distribution of Credit (Semester-wise)

SEM	BS	HS	ES	PC	PE	OE	PW	MC (Unit)	Mandatory Project	Total
SEM1	8.5	2	6	-	-	-	-	2	1	17.5
SEM2	8.5	1	13.5	-	-	-	-	2	1	24
SEM3	12	1.5	4.5	4.5	-	-	-	-	2	24.5
SEM4	-		4.5	12	-	-	-	4	2	18.5
SEM5	-	3	-	13.5	4.5	-	2	-	2	25
SEM6	-	-	-	13.5	3	3	2	2	2	23.5
SEM7	-		-	6	6	3	6	2	-	21
SEM8	-	2	-	-	3	3	11	-	-	19
Total	29	9.5	28.5	49.5	16.5	9	21	12	10	173
SEM	BS	HU	ES	PC	PE	OE	PW	MC	Mandatory Project	Total

Credit Distribution Ratio

		Total Credit	Percentage (%)	Range of Total Credits (%) as per AICTE	
				Minimum	Maximum
BS	Basic Sciences	29	17.8	15	20
HS	Humanities and Social Sciences	9.5	5.8	5	10
ES	Engineering Sciences	28.5	17.5	15	20
PC	Professional -Core	49.5	30.36	30	40
PE	Professional - Electives	16.5	10.12	10	15
OE	Open Electives	9	5.52	5	10
PW	Project Work/ Seminar/ Industrial Training etc.	21	12.8	10	15
MC	Mandatory Course	0	10Unit		
Mandatory Additional Requirement for earning under Graduate Professional Degree		0	100 units		
	Total:	**163**			
Mandatory Project Work(1st to 6th Semester)		10			
MOOCs		10	Additional 10 Credit Point for B.Tech.(IT) with Honours		
	Total:	**183**			

Mandatory Project Work (Project Based Learning) For B.Tech Students from Academic Year 2018-19 (1^{st} semester to 6^{th} Semester)

- Each Project Work will carry 0.5 Credit Point
- In the 1^{st} and 2^{nd} semester, students will do project work on any two subjects. The Choice of the subject on which a student wants to carry out his/her project work solely depends on the student. A Student can choose any 2 subjects of his/her own choice.
- In 3^{rd} to 6^{th} semesters, the total credit allocation is 2 for each semester. Hence, a student will have to carry out 4 project works to score 2 credits
- In 7^{th} and 8^{th} Semester, there will be no separate project work like previous semesters, since they have Major Project Work with high credit point
- Each Project will have total 100 marks
- Below given Table shows the allocation of credit and marks:

Semester	Total Credit Point	No. of Project to be carried out (Choice Based)	Marks allocation in each project	Total Marks allocated in Project Works
1^{st} Year				
1^{st} Semester	0.5*2=1.0	2	100	200
2^{nd} Semester	0.5*2=1.0	2	100	200
2^{nd} Year				
3^{rd} Semester	0.5*4=2.0	4	100	400
4^{th} Semester	0.5*4=2.0	4	100	400
3^{rd} Year				
5^{th} Semester	0.5*4=2.0	4	100	400
6^{th} Semester	0.5*4=2.0	4	100	400
Total Credit	**10**			

Format for Project Work Evaluation (B.Tech)

College Name: **Department :**

Paper Name : **Paper Code :**

STREAM : **Semester :**

University Roll No.	Name of the Student	Title of the Project	Semester Examination								
			Project Report (10)	Development of Prototype/ Model (20)	Power point presentation (15)	Viva-Voce (15)	Usage of Modern Tool / Technology (10)	Innovative-ness (10)	Individual contribution (10)	Group activity (10)	Total (100)

(Signature of the Project Supervisor(s)) (Signature of the HoD)

MOOCs Courses

For B.Tech Students from Academic Year 2018-19
(1st semester to 8th Semester)

[For Honors additional 10 Credit Point is to be earned (1st Sem to 8th Sem) through MOOCs courses. All the Certificates received by the students across all semester for MOOCs Courses from approved organization (Listed by AICTE / MAKAUT) is to be submitted to CoE office prior to 8th Semester Examination and the Credit earned through MOOCs courses will be reflected in their DGPA.]

List of websites which offers online certification Courses (Not Limited to..)

List of web portals which offer online certification courses:

- Swayam- https://swayam.gov.in/
- NPTEL- https://onlinecourses.nptel.ac.in/
- IIT Bombay Spoken Tutorial- https://spoken-tutorial.org/
- Mooc- http://mooc.org/
- Edx - https://www.edx.org/
- Coursera- https://www.coursera.org/
- Udacity - https://in.udacity.com/
- Udemy - https://www.udemy.com/
- Khanacademy - https://www.khanacademy.org/
- Skillsahre - https://www.skillshare.com/
- Harvard University - https://online-learning.harvard.edu/
- Ted - https://ed.ted.com/
- Alison - https://alison.com/
- Futurelearn - https://www.futurelearn.com/
- Web Development - https://digitaldefynd.com/best-free-web-development-courses-tutorials-certification/
- Digital Marketing - https://digitaldefynd.com/best-free-digital-marketing-certifications/
- ios app development - https://digitaldefynd.com/best-ios-app-development-course-tutorial/
- Open Learn - http://www.open.edu/openlearn/
- Future Learn - https://www.futurelearn.com/
- Tuts Plus - https://tutsplus.com/
- Open Culture - http://www.openculture.com/

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2nd Year 3rd Semester

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<tr><th colspan="9">C. SESSIONAL</th></tr>
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<tr><th colspan="9">D. PROJECT*</th></tr>
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<tr><td colspan="2">IT351</td><td>Data Structure and Algorithm</td><td colspan="4">1</td><td>0.5</td></tr>
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<tr><td colspan="2">PH351</td><td>Physics-II</td><td colspan="4">1</td><td>0.5</td></tr>
<tr><td colspan="2">EC(IT)353</td><td>Analog and Digital Electronics</td><td colspan="4">1</td><td>0.5</td></tr>
<tr><td colspan="4">*Total of Project (Student would select any four projects (Total Credit: 0.5*4=2))</td><td colspan="4">4</td><td>2</td></tr>
<tr><td colspan="4">Total no. of Theory Practical, Sessional and Project</td><td colspan="4">34</td><td>24.5</td></tr>
</table>

3RD SEMESTER

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**DATA STRUCTURE AND ALGORITHM**
SUBJECT CODE	:	**IT301**
YEAR	:	**SECOND**
SEMESTER	:	**3rd Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:
Basic Mathematics, Programming language

Course Objective:
The objective of the course is to provide knowledge of various data structures and algorithms; to introduce difference techniques for analyzing the efficiency of computer algorithms and provide efficient methods for storage, retrieval and accessing data in a systematic manner and explore the world of searching, sorting, traversal and graph tree algorithm along with demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists and trees.

Course Outcome
After completion of this course student will be able to

IT301.1: Use different kinds of data structures which are suited to different kinds of applications, and some are highly specialized to specific tasks.

IT301.2: Manage large amounts of data efficiently, such as large databases and internet indexing services.

IT301.3: Use efficient data structures which are a key to designing efficient algorithms.

IT301.4: Use some formal design methods and programming languages which emphasize on data structures, rather than algorithms, as the key organizing factor in software design.

IT301.5: Store and retrieve data stored in both main memory and in secondary memory.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT301.1	3	2		1			1					
IT301.2	3	3	2	3								
IT301.3	3		3									
IT301.4		3		2								
IT301.5		3		2								

Course Contents:

MODULE –I : [8L]
Introduction : Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations. Array : Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials. Linked List : Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

MODULE –II: [5L]
[Stack and Queue : Stack and its implementations (using array, using linked list), applications. Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications. Recursion : Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.
MODULE –III : [12L]

Trees : Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree-operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only). Huffman tree.

Graphs : Graph definitions and Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications. Minimal spanning tree – Prim's algorithm

MODULE – IV: [10L]

Sorting Algorithms : Internal sorting and external sorting Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap), radix sort. Tree Sort technique .Searching : Sequential search, binary search, interpolation search. Hashing : Hashing functions, collision resolution techniques

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E. Mc graw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**MATHEMATICS –III**
SUBJECT CODE	:	**M(IT)301**
YEAR	:	**SECOND**
SEMESTER	:	**3rd Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:
The students to whom this course will be offered must have the concept of (10+2) standard set theory, calculus, basic probability.

Course Objective:
The objective of this course is to disseminate the prospective engineers with the knowledge of Graph Theory and Algebraic structure. It also aims to equip the students with concepts and tools of probability distribution as an intermediate to the advanced level of applications that they would find useful in their disciplines.

Course Outcome
After completion of this course student will be able to

M(IT)301.1: Recall the distinctive characteristics of probability distribution, abstract algebra, and graph theory.

M(IT)301.2: Demonstrate the theoretical working of probability distribution, abstract algebra, and graph theory.

M(IT)301.3: Compute the probability of real world uncertain phenomena by indentifying probability distribution that fits the phenomena.

M(IT)301.4: Construct the shortest path and minimal spanning tree from a given graph using the algorithms of graph theory.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M(IT)301.1	3	1	1									1
M(IT)301.2	3	2	1									1
M(IT)301.3	3	2	2									1
M(IT)301.4	3	2	2									1

Course Contents:

MODULE I [10L] : Probability Distributions
Random Variable: Discrete and Continuous (definition & examples); Probability Distribution (definition & examples); Probability Mass Function, Probability Density Function and Distribution Function for a single random variable only (definition, properties & related problems); Expectation, Variance and Standard Deviation for a single random variable only (definition, properties & related problems); Binomial Distribution, Poisson Distribution, Binomial Approximation to Poisson Distribution and Normal Distribution (problems only), Mean, Variance and Standard Deviation of Binomial, Poisson and Normal Distribution (problems only).

MODULE II [9L] : Algebraic Structures

Group (definition), Lagrange's theorem, Subgroup, Normal subgroup, Cyclic group, Permutation group, Symmetric group (S3).

MODULE III [14L] : Graph Theory

Basics of Graph Theory and related theorems and problems; Digraphs; Weighted Graph; Connected and Disconnected graph; Bipartite Graph; Complement of a Graph; Regular Graph; Complete Graph; Walk, Path, Circuit, Euler Graph; Cut Set and Cut Vertices; Adjacency and Incidence Matrices of a graph (digraph); Isomorphism.

Basics of Tree and related theorems, Binary Tree, Spanning Tree, Minimal Spanning Tree, Dijkstra's algorithm, Kruskal's Algorithm, Prim's Algorithm.

Planar and Dual Graphs; Euler formula for connected planar graph.

Project Domains:

1. Study of physical processes through Graph theory.
2. Study of uncertainty in real world phenomena using probability distribution.
3. Application of Abstract Algebra in engineering problems.

Text Books:

1. Das, N.G. Probability and Statistics; The McGraw Hill Companies.
2. Gupta, S. C. and Kapoor, V. K. Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
3. Deo, N. Graph Theory with Applications to Engineering and Computer Science, Prentice Hall.
4. Mapa, S. K. Higher algebra: Abstract and Linear, Levant, 2011.
5. Chakraborty, S. K. and Sarkar, B. K. Discrete Mathematics, OXFORD University Press.

Reference Books:

1. Chandrasekaran, N. and Umaparvathi, M. Discrete Mathematics, PHI
2. Lipschutz, S. Theory and Problems of Probability (Schaum's Outline Series), McGraw Hill Book. Co.
3. Spiegel, M. R. Theory and Problems of Probability and Statistics (Schaum's Outline Series), McGraw Hill Book Co.
4. Grewal, B. S. Higher Engineering Mathematics, Khanna Pub.
5. Kreyzig, E. Advanced Engineering Mathematics, John Wiley and Sons.
6. Sharma, J.K. Discrete Mathematics, Macmillan.
7. Spiegel, M. R., Schiller, J.J. and Srinivasan, R.A. Probability and Statistics (Schaum's Outline Series), TMH.
8. Wilson: Introduction to graph theory, Pearson Education.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : NEMERICAL METHODS AND STATISTICS
SUBJECT CODE : M(IT)302
YEAR : SECOND
SEMESTER : 3rd Semester
CONTACT HOURS : 3L
CREDITS : 3

Pre requisites:
The students to whom this course will be offered must have the concept of (10+2) standard number system, algebra and calculus.

Course Objective:
The purpose of this course is to provide basic understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic.

Course Outcomes:
On successful completion of the learning sessions of the course, the learner will be able to:

M(IT)302.1: Recall the distinctive principles of numerical analysis and the associated error measures.
M(IT)302.2: Understand the theoretical workings of numerical techniques.
M(IT)302.3: Apply numerical methods used to obtain approximate solutions to intractable mathematical problems such as interpolation, integration, the solution of linear and nonlinear equations, and the solution of ordinary differential equations.
M(IT)302.4: Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources.
M(IT)302.5: Interpret complex statistical findings using the understanding of inferential statistics.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
M(IT)302.1	3	1	1									1
M(IT)302.2	3	2	1									1
M(IT)302.3	3	2	2									1
M(IT)302.4	3	3	2	3								1
M(IT)302.5	3	3	2	3								1

Course Contents:

MODULE I [7L]: Error Analysis and Interpolation
Approximation in Numerical Computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic.

Interpolation: Difference Operators: Forward and Backward, Shift Operator; Newton forward interpolation, Newton backward interpolation, Lagrange's Interpolation.

MODULE II [6L]: Numerical Solution of Linear and Non-linear Equations

Numerical Solution of a System of Linear Equations: Gauss elimination method, LU Factorization method, Gauss-Seidel iterative method.

Solution of Polynomial and Transcendental Equations: Bisection method, Regula-Falsi, Newton-Raphson method.

MODULE III[6L]: Numerical Integration and Numerical Solution of Differential Equation

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.

Numerical solution of ordinary differential equation: Euler's method,Euler's modified method, Fourth order Runge-Kutta method.

MODULE III[14L]: Statistics
Basic Statistics: Basic statistics, measure of central tendency, mean, median, mode, dispersion, correlation coefficient and regression.

Sampling theory: Random sampling. Statistic and its Sampling distribution. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems.

Estimation of parameters: Unbiased and consistent estimators. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson).Confidence intervals and related problems

Project Domains:

1. Study on Numerical solution of ODE in Engineering Field.
2. Application of numerical methods for the relevant field.
3. Mathematical modelling.
4. Statistical analysis of data related to different Engineering fields.

Text Books:

1. Shishir Gupta &S.Dey, Numerical Methods, Mc. Grawhill Education Pvt. Ltd.
2. C.Xavier: C Language and Numerical Methods, New age International Publisher.
3. Dutta& Jana: Introductory Numerical Analysis. PHI Learning
4. J.B.Scarborough: Numerical Mathematical Analysis.Oxford and IBH Publishing
5. Jain, M. K., Iyengar, S. R. K. and Jain, R. K. Numerical Methods (Problems and Solution). New age International Publisher.
6. Prasun Nayek: Numerical Analysis, Asian Books
7. N. G. Das: Statistical Methods, TMH.
8. Sancheti , D. S. & Kapoor ,V.K. : Statistics Theory , Method & Application, Sultan chand & sons ,New Delhi

Reference Books:

1. Balagurusamy, E. Numerical Methods, Scitech. TMH.
2. Dutta, N. Computer Programming & Numerical Analysis, Universities Press.
3. Guha, S. and Srivastava, R. Numerical Methods, Oxford Universities Press.
4. Shastri, S. S. Numerical Analysis, PHI.
5. Mollah, S. A. Numerical Analysis, New Central Book Agency.
6. Numerical Methods for Mathematics ,Science&Engg., Mathews, PHI.
7. Rao, G. S. Numerical Analysis, New Age International.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PHYSICS-II**
SUBJECT CODE	**:**	**PH301**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rd Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Knowledge of Physics up B.Tech 1st year Physics-I course

Course Objective:
The Physics-II course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcome
After completion of this course student will be able to

PH301.1:	Define ➢ understand and explain electrostatics, magnetostatics and electromagnetic theory. ➢ operator formalism in Quantum Mechanics. ➢ categories of storage devices. ➢ materials at the low-dimensions. ➢ fundamental particles.
PH301.2:	Apply the knowledge of ➢ Vector space & Heisenberg representation in developing knowledge of quantum bit Quantum bit and its representation as a two level system to design quantum logic gates. ➢ Schrödinger equation in problems of junction diode, tunnel diode. ➢ Magnetism and semiconductors in data storage. ➢ Electromagnetic theory in communication and networking. ➢ Poisson's equations in various electronic systems. ➢ Fermi levels in intrinsic and extrinsic semiconductors.
PH301.3:	Analyze ➢ Role of superposition principle in generation of large number of Qubits. ➢ The principle of display devices. ➢ Which type of magnetic materials to be used for data storage purpose. ➢ Role of quantum confinement in inducing novel feature of a nano material. ➢ Change in electric and magnetic fields in various symmetrical bodies. ➢ Quantum gates and quantum circuits.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH301.1	3	1										1
PH301.2	3	2										2
PH301.3	2	3										1

- **Course Contents**

Module 1: Quantum Mechanics-II, Quantum Computation and Communication [12L]
Quantum Mechanics-II
Formulation of quantum mechanics and Basic postulates; Operator correspondence-Measurements in Quantum Mechanics- Eigen value, Eigen function, superposition principle, orthogonality of wave function, expectation value. Commutator. Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Schrödinger's equation as energy eigen value equation, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well; Discussion on degenerate levels), 1D finite barrier problem and concept of quantum tunnelling (solve only $E<V_0$).

Quantum Computation and Communication
The idea of n- dimensional vector space, use of 'bra-ket' notation, matrix representation of bra &kets; basis, Hilbert space; Pauli matrices. Idea of qubit and examples of single qubit logic gates- Classical bits, qubit as a two level system; Bloch vector, Pauli gate, Hadamard gate, Phase shift gate, Quantum circuits related to Quantum gates.

Module 2: Statistical Mechanics [6L]
Basics of Statistical Mechanics: Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, MB, BE, FD, statistics (Qualitative discussions)- physical significance, conception of bosons, fermions, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, Concept of Fermi level.
Applications of Statistical Mechanics: Qualitative study: Fermi level in metals, total energy at absolute zero and total number of particles. Fermi level for intrinsic and extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p type, n-type).

Module 3: Storage and display devices [3L]
Different storage and display devices-Magnetic storage materials, Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Operation and application of CRT, Liquid crystal display (LCD), LED, Plasma display, Thin film transistor display).

Module 4 : Concept of Polarisation [3L]
Definition, Plane of polarization, Plane of vibration, Malus Law, Fundamental concepts of plane, circular & elliptical polarizations (only qualitative idea) with examples, Brewster's law, Double refraction : Ordinary & Extra ordinary rays, Nicol's prism, Engineering applications in E.M.Theory, Numerical problems.

Module 5: Electricity and Magnetism [8L]
Electrostatics: Gauss's law in integral form and conversion into differential form, Equation of continuity, Extend to Poisson's & Laplace's equation, Application to parallel plate, spherical and cylindrical capacitors.
Magnetostatics: Lorentz force (concept in Hall effect), force on a small current element placed in a magnetic field. Biot-Savart law- non existence of magnetic monopole, Ampere's circuital law, Magnetic vector and scalar potential.
Electro-magnetism &Electromagnetic theory: Faraday's law, Concept of displacement current, Maxwell's field equations with physical significance, wave equation in free space, transverse nature of electromagnetic wave.

Module 6: Physics of Nanomaterials [3L]
Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Application of nanomaterials (CNT, grapheme, electronic, environment, medical).

Text Books

1. Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2,
2. Principles of Engineering Physics Vol 1 and Vol 2; by Md. N. Khan and S. Panigrahi, Pub: 3. Cambridge Univ. press
3. Introduction to Quantum MechanicsS. N. Ghoshal (Calcutta Book House)
4. Introduction to solid state physics-Kittel (TMH)
5. Nanostructure and Nanomaterials, B.K. Parthasarathy

Reference Books

1. Edward M Purcell Introduction to Electrodynamics Griffiths David J. The Feynman Lectures on Physics. 2 (2nd ed.).,
2. Feynman, Richard P Addison-Wesley. ISBN 978-0-8053- 9065-0
3. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
4. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
5. Quantum Computation and Quantum Information(10th Anniversary Edition)- Nielsen
6. Chuang (Cambridge University Press)
7. Solid State Physics- Ali Omar (Pearson Eduction)
8. Solid state physics- S. O. Pillai
9. Solid State Physics-A. J. Dekker (Prentice-Hall India)
10. Introduction to Nanotechnology, B.K. Parthasarathy
11. Nanomaterials Handbook (Advanced Materials and Technologies)- YuryGogotsi (Editor)

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : ANALOG AND DIGITAL ELECTRONICS
SUBJECT CODE : EC(IT)303
YEAR : SECOND
SEMESTER : 3rd Semester
CONTACT HOURS : 3L
CREDITS : 3

Prerequisite:
Mathematics, Physics, Basic Electronics.

Course Objective:
The objective of the course is to prepare students to perform the analysis and design of various digital and analog electronic circuits.

Course Outcome
After completion of this course student will be able to

EC(IT)303.1: Understand basic analog and digital electronics, including semiconductor properties, operational amplifiers, combinational and sequential logic and analog-to-digital digital-to-analog conversion techniques
EC(IT)303.2: Identify different symbols, working principles of basic Digital electronics circuits for data processing application
EC(IT)303.3: Analyze the characteristics of basic digital circuits
EC(IT)303.4: Design analog amplifiers, combinational logic devices and sequential logic devices like counters and registers

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC(IT)303.1	2					2						1
EC(IT)303.2	2											1
EC(IT)303.3		2		3								
EC(IT)303.4		2	3	2	1	1	2					

Course Contents

MODULE I [10L] :
Analog Electronics: Recapitulation of P-N diodes, BJT, FET , Feedback and OPAMP, Power Amplifiers – Class A, B, AB and C - basic concepts, power, efficiency calculation; Phase Shift, Wein Bridge oscillators; Astable & Monostable Multivibrators, 555 Timer and Multivibrators ; Schimtt Trigger circuit.

MODULE II [9L] :
Introduction to Number Systems: Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, EBDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods , Binary arithmetic; Boolean algebra; Various logic gates; Representation in SOP and POS forms; Minimization of logic expressions by algebraic method, K-MAP method and Quin Mc-Clusky Method.

MODULE III [5L] :

Combinational Circuits: Adder and Substractor; Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and Checker.

MODULE IV [6L] :

Sequential Circuits: Basic Flip-flop & Latch ; SR, JK, D, T and JK Master-slave Flip Flops Registers (SISO,SIPO,PIPO,PISO); Ring counter, Johnson counter ; Basic concept of Synchronous and Asynchronous counters ; Design of synchronous and asynchronous Mod N Counter.

MODULE V [2L] :

A/D and D/A conversion techniques: Basic concepts of R-2R , A/D and D/A; successive approximation ADC

MODULE VI [2L] :

Logic families: TTL, ECL, MOS and CMOS - basic concept

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications', D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DATA STRUCTURE LAB**
SUBJECT CODE	**:**	**IT391**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3^{rd} Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**1.5**

Perquisite:
Basic Mathematics, Programming language

Course Objective:
To develop the conceptual understanding for solving problems using data structures such as linear lists, stacks, queues, hashing, trees and graphs and writing programs for these solutions.

Course Outcome:
After completion of this course student will be able to

IT391.1: Understand the concept of dynamic memory management, data types, basic data structures, and complexity analysis.

IT391.2: Introduce the concept of data structures through ADT.

IT391.3: Choose the appropriate linear and non-linear data structure and algorithm design method for a specified application design.

IT391.4: Analyze the complexity of the problems.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT391.1	3	2	1									
IT391.2	2	3	1	3								
IT391.3	3	3	3	3	2				2			3
IT391.4	3	2	1	3	2							1

Course Content:

1. Experiments should include but not limited to Implementation of array operations:
2. Stack and Queues: adding, deleting, elements circular Queue: Adding& deleting elements
3. Merging Problem:
4. Evaluation of expressions operations on Multiple stacks & queues:
5. Implementation of linked list: inserting, deleting, inverting a linked list
6. Implementation of stacks and queues
7. Using linked lists: Polynomial addition, Polynomial multiplication

8. Sparse Matrices: Multiplication , addition
9. Recursive and Non Recursive traversal Trees
10. Threaded binary tree traversal. AVL tree implementation
11. Application of Trees. Application of sorting and searching algorithms
12. Hash tables implementation: searching, inserting and deleting, searching and sorting techniques.

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E. Mc graw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **NEMERICAL METHODS AND STATISTICS LAB**
SUBJECT CODE : **M(IT)392**
YEAR : **SECOND**
SEMESTER : **3rd Semester**
CONTACT HOURS : **3**
CREDITS : **1.5**

Pre requisites: Any introductory course on programming language (example. C/ MATLAB).

Course Objective: The purpose of this course is to provide basic programming skills for solving the problems in numerical methods.

M(IT)392.1: Understand the theoretical workings of numerical techniques with the help of C/MATLAB
M(IT)392.2: Execute basic command and scripts in a mathematical programming language
M(IT)392.3: Apply the programming skills to solve the problems using multiple numerical approaches.
M(IT)392.4: Analyze if the results are reasonable, and then interpret and clearly communicate the results.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
M(IT)392.1	3	2	1									1
M(IT)392.2	3	2	2									1
M(IT)392.3	3	2	2									1
M(IT)392.4	3	3	2	3								1

Course Contents:

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule
3. Assignments on numerical solution of a system of linear equations using Gauss elimination, Gauss Jacobi and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Newton-Raphson method.
5. Assignments on ordinary differential equation: Euler's method, Euler's modified method, Runge-Kutta methods.
6. Simple problems as assignment on Measures of Central Tendency- mean, median, mode, Measures of Dispersion- variance, standard deviation. Problems related to engineering field.

Implementation of numerical methods on computer through C/C++ and commercial Software Packages: Matlab / Scilab / Labview / Mathematical/NAG (Numerical Algorithms Group/Python.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : PHYSICS-II LAB
SUBJECT CODE : PH391
YEAR : SECOND
SEMESTER : 3rd Semester
CONTACT HOURS : 3P
CREDITS : 1.5

Perquisite:
Knowledge of Physics upto B.Tech Physics-I lab

Course Objective:
The Physics-II Lab course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcomes:
At the end of the course students will be able to know to find out:

PH(IT)391.1: Examine the characteristics of analog electronic circuit devices such as BJTs and FETs, amplifiers
PH(IT)391.2: Make use of different basic logic gates and universal gates
PH(IT)391.3: Implement the combinational circuits in digital electronics using basic logic gates
PH(IT)391.4: Construct sequential circuits like registers and counters using flip-flops and basic gates

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH(IT)391.1	3	2										1
PH(IT)391.2	1	2		3								1
PH(IT)391.3	1	2							3			1
PH(IT)391.4	1	2								3		

Course Contents:

MODULE I : -Electricity Magnetism

1. Study of dipolar magnetic field behaviour.
2. Study of hysteresis curve of a ferromagnetic material using CRO.
3. Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.
4. Measurement of Curie temperature of the given sample.
5. Determination of dielectric constant of given sample (frequency dependent).
6. Determination of Hall co-efficient of a semiconductor and measurement of Magneto resistance of a given semiconductor

MODULE II: -Quantum Mechanics-II

7. Determination of Stefan's radiation constant.
8. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells & measurement of maximum workable power.
9. Measurement of specific charge of electron using CRT.

10. Determination of band gap of a semiconductor.
In addition to regular 7 experiments it is **recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:

1. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
2. Determination of thermal conductivity of a good conductor by Searle's mothod.
3. Study of I-V characteristics of a LED.
4. Study of I-V characteristics of a LDR
5. Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.

Text Books

1. 1.Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2,
2. Principles of Engineering Physics Vol 1 and Vol 2; by Md. N. Khan and S. Panigrahi, Pub:
3. Cambridge Univ. press
4. Introduction to Quantum MechanicsS. N. Ghoshal (Calcutta Book House)
5. Introduction to solid state physics-Kittel (TMH)
6. Nanostructure and Nanomaterials, B.K. Parthasarathy

Reference Book s

1. Edward M Purcell Introduction to Electrodynamics Griffiths David J. The Feynman Lectures on Physics. 2 (2nd ed.).,
2. Feynman, Richard P Addison-Wesley. ISBN 978-0-8053- 9065-0
3. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
4. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
5. Quantum Computation and Quantum Information(10th Anniversary Edition)- Nielsen

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **ANALOG & DIGITAL ELECTRONICS LAB**
SUBJECT CODE : **EC(IT)393**
YEAR : **SECOND**
SEMESTER : **3rd Semester**
CONTACT HOURS : **3P**
CREDITS : **1.5**

Perquisite:
Mathematics, Basic Electronics, concepts of basic Electrical components.

Course Objective:
The objective of the course is to illustrate the students different electronic circuit and their application in practice.

Course Outcomes:
At the end of the course students will be able to know to find out:

EC(IT)393.1: Examine the characteristics of analog electronic circuit devices such as BJTs and FETs, amplifiers

EC(IT)393.2: Make use of different basic logic gates and universal gates

EC(IT)393.3: Implement the combinational circuits in digital electronics using basic logic gates

EC(IT)393.4: Construct sequential circuits like registers and counters using flip-flops and basic gates

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC(IT)393.1				2								
EC(IT)393.2	2			2								1
EC(IT)393.3		2	2									
EC(IT)393.4		3	2			1						

Course Content:
1. Design of a Class A amplifier.
2. Design of a Phase-Shift Oscillator.
3. Design of a Schmitt Trigger using Opamp.
4. Design of a Multivibrator circuit using 555 timer.
5. Design of Half and Full adder and Half and Full Substractor
6. Construction of simple Decoder & Multiplexer circuits using logic gates
7. Realization of RS / JK / D flip flops using logic gates
8. Design of Shift Register using J-K / D Flip Flop.
9. Realization of Synchronous Up/Down counter.
10. Design of MOD- N Counter (Synchronous and Asynchronous).
11. Study of DAC and ADC.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**TECHNICAL REPORT WRITING AND LANGUAGE PRACTICE**
SUBJECT CODE	:	**HU381**
YEAR	:	**SECOND**
SEMESTER	:	**3rd Semester**
CONTACT HOURS	:	**3P**
CREDITS	:	**1.5**

Perquisite:
The course presupposes a high school level knowledge of English grammar, punctuation, and elementary to intermediate reading and writing skills.

Course Objective:
The basic objectives of this course are to impart professional communication skills in the globalized workplace context, to enable functional competence in reading and writing so as to create industry-ready personnel.

Course Outcomes:

After completion of this course student will be able to:-

HU381.1: Know about and employ communication in a globalized workplace scenario

HU381.2: Understand and apply reading skills and sub-skills.

HU381.3: Acquire a working knowledge of writing strategies, formats and templates of professional writing.

HU381.4: Apply and make use of the modalities of intercultural communication.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU381.1	3						1			3		2
HU381.2	2	3	2			2	2			3		3
HU381.3	1	3				3	3			3		3
HU381.4						3	3			3		3

Course Contents:

Module 1 [2L+2P] : The Need for a Language Laboratory
(a) Introduction to the Language Lab
(b) Skill-building exercises in the lab

Module 2 [2L+3P] : Power Listening
(a)Taxonomy of Listening Skills & Sub-skills [Aural Skimming, Scanning, Listening for Details, Note taking, Evaluative Listening, Empathetic Listening, Paralinguistic and Kinesic Inferencing]
(b)Audio-based Lessons
(c) Repairing Listening 'Gaps' through Learner Feedback

Module 3 [2L+6P] : Speaking Skills
(a)The Need for Speaking: Content and Situation-based speaking
(b)Speaking Activities: [Just a Minute, Paired Role Play, Situational Speaking Exercises]

(c)The Pragmatics of Speaking—Pronunciation practice and learner feedback.

Module 4 [2L+6P] : Group Discussion
(a)Teaching GD Strategies
(b)In-house video viewing sessions
(c)Extended Practice and feedback

Module 5 [2L+6P] : Writing a Technical Report
(a)Organizational Needs for Reports and types
(b)Report Formats
(c)Report Writing Practice Sessions and Workshops

Module 6 [2L+3P] : SWOT Analysis
(a)SWOT Parameters
(b)Organizational SWOT
(c) Case Study

Module 7 [2L+6P] : Presentation
(a)Teaching Presentation as a Skill
(b)Speaking Strategies and Skills
(c)Media and Means of Presentation
(d)Extended Practice and Feedback

Module 8 [2L+3P] : Personal Interview
(a)Preparing for the Interview: Interview Basics, Dressing and Grooming, Q & A
(b)Mock Interview sessions and feedback

Reference Books:

1. Raymond Murphy. English Grammar in Use. 3rd Edn. CUP, 2001.
2. A. J Thomson and A. V. Martinet. A Practical English Grammar Oxford: OUP, 1980.
3. Michael Swan. Practical English Usage. Oxford: OUP, 1980.
4. Simeon Potter. Our Language. Oxford: OUP, 1950.
5. Pickett, Laster and Staples. Technical English: Writing, Reading & Speaking. 8th ed. London: Longman, 2001.
6. Ben Heasley and Liz Hamp-Lyons. Study Writing. Cambridge: CUP, 2006.

Curriculum of B.Tech (IT) Programme
Implemented from the Academic Year 2016

1ST YEAR, 1ST SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	BS	M101	MATHEMATICS-I	3	1	0	4	4
2	BS	PH101	PHYSICS-I	3	1	0	4	4
3	ES	EC101	BASIC ELECTRONICS ENGINEERING	3	1	0	4	4
4	ES	ME101	ENGINEERING MECHANICS	3	1	0	4	4
5	HS	HU101	COMMUNICATIVE ENGLISH	2	0	0	2	2
Total no. of Theory:								**18**
PRACTICAL								
6	BS	PH191	PHYSICS-I LAB	0	0	3	3	2
7	ES	EC191	BASIC ELECTRONICS ENGINEERING LAB	0	0	3	3	2
8	ES	ME192	WORKSHOP PRACTICE	0	0	3	3	2
9	HS	HU191	LANGUAGE LAB & SEMINAR PRESENTATION	0	0	3	3	1
Total no. of Practical:								**7**
SESSIONAL								
10	HS	XC181	EXTRA CURRICULAR ACTIVITY (NSS/NCC)	0	0	2	2	1
TOTAL								**26**

1ST YEAR, 2ND YEAR SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	BS	M201	MATHEMATICS-II	3	1	0	4	4
2	BS	CH201	CHEMISTRY	3	1	0	4	4
3	ES	EE201	BASIC ELECTRICAL ENGINEERING	3	1	0	4	4
4	ES	CS201	COMPUTER FUNDAMENTALS AND PRINCIPLE OF COMPUTER PROGRAMMING	3	1	0	4	4
5	ES	ME201	ENGINEERING THERMODYNAMICS AND FLUID MECHANICS	3	1	0	4	4
Total no. of Theory:								**20**
PRACTICAL								
6	BS	CH291	CHEMISTRY LAB	0	0	3	3	2
7	ES	CS291	COMPUTER FUNDAMENTALS AND PRINCIPLE OF COMPUTER PROGRAMMING LAB	0	0	3	3	2
8	ES	EE291	BASIC ELECTRICAL ENGINEERING LAB	0	0	3	3	2
9	ES	ME291	ENGINEERING DRAWING AND GRAPHICS	0	0	3	3	2
Total no. of Practical:								**8**
SESSIONAL								
10	MC	MC281	SOFT SKILL DEVELOPMENT	0	0	3	3	2 units
TOTAL								**28**

2^{ND} YEAR, 3^{RD} SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	BS	M(IT)301	MATHEMATICS- III	3	1	0	4	4
2	BS	PH(IT)301	PHYSICS- II	3	0	0	3	3
3	BS	M(IT)302	NUMERICAL METHODS AND STATISTICS	3	0	0	3	3
4	ES	EC(IT)303	ANALOG AND DIGITAL ELECTRONICS	3	0	0	3	3
5	PC	IT301	DATA STRUCTURE & ALGORITHM	3	1	0	4	4
Total no. of Theory:								**17**
PRACTICAL								
6	BS	PH(IT)391	PHYSICS-II LAB	0	0	3	3	2
7	BS	M(IT)392	NUMERICAL METHODS AND STATISTICS LAB	0	0	3	3	2
8	ES	EC(IT)393	ANALOG & DIGITAL ELECTRONICS LAB	0	0	3	3	2
9	PC	IT391	DATA STRUCTURE LAB	0	0	3	3	2
Total no. of Practical:								**8**
SESSIONAL								
10	HS	HU381	TECHNICAL REPORT WRITING AND LANGUAGE PRACTICE	0	0	2	2	1
TOTAL								**26**

2^{ND} YEAR, 4^{TH} SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	HS	HU401	ENVIRONMENTAL SCIENCE	2	0	0	2	2
2	PC	IT401	COMPUTER ORGANIZATION & ARCHITECTURE	3	1	0	4	4
3	PC	IT402	COMMUNICATION ENGINEERING & CODING THEORY	3	0	0	3	3
4	PC	IT403	FORMAL LANGUAGE AND AUTOMATA THEORY	3	0	0	3	3
5	PC	IT404	OBJECT ORIENTED PROGRAMMING USING JAVA	3	0	0	3	3
Total no. of Theory:								**15**
PRACTICAL								
6	PC	IT491	COMPUTER ORGANIZATION & ARCHITECTURE LAB	0	0	3	3	2
7	PC	IT492	COMMUNICATION ENGINERING & CODING THEORY LAB	0	0	3	3	2
8	PC	IT494	OBJECT ORIENTED PROGRAMMING LAB	0	0	3	3	2
Total no. of Practical:								**6**
SESSIONAL								
9	MC	MC481	TECHNICAL SKILL DEVELOPMENT	0	0	3	3	2 units
TOTAL								**21**

3RD YEAR, 5TH SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	PC	IT501	DESIGN ANALYSIS OF ALGORITHM	3	1	0	4	4
2	PC	IT502	SOFTWARE ENGINEERING	3	1	0	4	4
3	PC	IT503	OPERATING SYSTEM	3	1	0	4	4
4	PE	IT504A IT504B IT504C	PROGRAMMING PRACTICE WITH C++ ARTIFICIAL INTELLIGENCE OPERATIONS RESEARCH	3	1	0	4	4
5	HS	HU505	INDUSTRIAL AND FINANCIAL MANAGEMENT	2	0	0	2	2
Total no. of Theory:								**18**
PRACTICAL								
6	PC	IT591	DESIGN ANALYSIS OF ALGORITHM LAB	0	0	3	3	2
7	PC	IT592	SOFTWARE ENGINEERING LAB	0	0	3	3	2
8	PC	IT 593	OPERATING SYSTEM LAB	0	0	3	3	2
9	PE	IT 594A IT 594B IT 594C	PROGRAMMING PRACTICE WITH C++ LAB ARTIFICIAL INTELLIGENCE LAB OPERATIONS RESEARCH LAB	0	0	3	3	2
Total no. of Practical:								**8**
SESSIONAL								
10	PW	IT581	MINI PROJECT - I	0	0	4	4	2
TOTAL:								**28**

3RD YEAR: 6TH SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	PC	IT 601	DATABASE MANAGEMENT SYSTEM	3	1	0	4	4
2	PC	IT 602	WEB TECHNOLOGY	3	0	0	3	3
3	PC	IT 603	COMPUTER NETWORKING	3	1	0	4	4
4	PE	IT 604 A IT 604 B IT 604 C IT 604 D	ERP INFORMATION & CODING THEORY MICROPROCESSOR & MICROCONTROLLER DIGITAL IMAGE PROCESSING	3	1	0	4	4
5	OE	ECE(IT)605A IT 605 B IT 605 C IT 605 D IT 605 E IT 605 F	DIGITAL SIGNAL PROCESSING COMPILER DESIGN GREEN COMPUTING SOFT COMPUTING PROJECT MANAGEMENT HUMAN RESOURCE MANAGEMENT	3	0	0	3	3
Total no. of Theory:								**18**
PRACTICAL								
6	PC	IT691	DATABASE MANAGEMENT SYSTEM LAB	0	0	3	3	2
7	PC	IT692	WEB TECHNOLOGY LAB	0	0	3	3	2
8	PC	IT693	COMPUTER NETWORKING LAB	0	0	3	3	2
9	PC	IT694	SYSTEM ENGINEERING LAB	0	0	3	3	2
Total no. of Practical:								**8**
SESSIONAL								
10	PW	IT682	MINI PROJECT - II	0	0	4	4	2
11	MC	MC681	SEMINAR/GD/ PRESENTATION SKILL/ FOREIGN LANGUAGE	0	0	3	3	2 units
TOTAL								**28**

4TH YEAR: 7TH SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	PC	IT701	E - COMMERCE	3	0	0	3	3
2	PE	IT702A IT702B IT702C	COMPUTER GRAPHICS AND MULTIMEDIA PATTERN RECOGNITION INTERNET TECHNOLOGY	3	0	0	3	3
3	PE	IT703 A IT703 B IT703 C	CLOUD COMPUTING DISTRIBUTED SYSTEMS DATA WAREHOUSING AND DATA MINING	3	0	0	3	3
4	OE	IT704A EE(IT)704B ECE(IT)704C IT704D	MODELLING AND SIMULATION CONTROL SYSTEM MICROELECTRONICS AND VLSI DESIGN MOBILE COMMUNICATION	3	0	0	3	3
Total no. of Theory:								**12**
PRACTICAL								
5	PC	IT791	E – COMMERCE LAB	0	0	3	3	2
6	PE	IT792A IT792B IT792C	COMPUTER GRAPHICS & MULTIMEDIA LAB PATTERN RECOGNITION LAB INTERNET TECHNOLOGY LAB	0	0	3	3	2
Total no. of Practical:								**4**
SESSIONAL								
7	PW	IT781	INDUSTRIAL TRAINING	0	0	0	4 weeks	2
8	PW	IT782	PROJECT-I	0	0	6	6	3
9	MC	IT783	SEMINAR/GD/ PRESENTATION SKILL/ FOREIGN LANGUAGE	0	0	3	3	2 units
TOTAL								**21**

4TH YEAR: 8TH SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	PE	IT801A IT801B IT801C IT801D	ADVANCED COMPUTER ARCHITECTURE CRYPTOGRAPHY AND NETWORK SECURITY NATURAL LANGUAGE PROCESSING BIO-INFORMATICS	3	0	0	3	3
2	OE	IT802A IT802B IT802C IT802D	BUSINESS ANALYTICS CYBER LAW AND SECURITY POLICY ADVANCED DBMS INTERNET OF THINGS	3	1	0	4	4
3	HS	HU802	VALUES & ETHICS IN PROFESSIONS	2	0	0	2	2
Total no. of Theory:								**9**
PRACTICAL								
SESSIONAL								
4	PW	IT 881	DESIGN LAB/ INDUSTRIAL PROBLEM RELATED PRACTICAL TRAINING	0	0	3	3	2
5	PW	IT 882	PROJECT II	0	0	12	12	6
6	PW	IT 883	GRAND VIVA	0	0	0	0	3
TOTAL								**20**

		Total Credit	Percentage (%)	Range of Total Credits (%) as per AICTE	
				Minimum	Maximum
HS	Humanities and Social Sciences	11	5.55	5	10
BS	Basic Sciences	34	17.17	15	20
ES	Engineering Sciences	35	17.67	15	20
PW	Project Work/ Seminar/ Industrial Training etc.	20	10.10	10	15
PC	Professional -Core	67	33.83	30	40
PE	Professional -Electives	21	10.60	10	15
OE	Open Electives	10	5.05	5	10
MC	Mandatory Course	0	8units		
	Total:	198			

1ST SEMESTER

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**MATHEMATICS–I**
SUBJECT CODE	:	**M101**
YEAR	:	**FIRST**
SEMESTER	:	**1st Semester**
CONTACT HOURS	:	**3L + 1T**
CREDITS	:	**4**

Prerequisite:

Any introductory course on matrix algebra, calculus, geometry.

Course Objective:

The purpose of this course is to provide fundamental concepts matrix algebra, Calculus of Single and Several Variables and Vector Analysis.

Course Outcome

On successful completion of the learning sessions of the course, the learner will be able to:

M101.1: Recall the distinctive characteristics of Matrix Algebra, Calculus of Single and Several Variables and Vector Analysis to analyze the problems in Science & Technology.

M101.2: Demonstrate the theoretical concept of Matrix Algebra, Calculus of Single and Several Variables, and Vector Analysis and understand the related working principles to solve the problems in Science & Technology.

M101.3: Develop mathematical model of various real world scenarios using concepts of Matrix algebra, Calculus of Single and Several Variables, and Vector Analysis and solve the same, judge if the results are reasonable, and then interpret and clearly communicate the results.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M101.1	3	2										1
M101.2	3	2										1
M101.3	3	2	2									1

Course Contents:

MODULE I [10L]

Matrix Algebra: Elementary row and column operations on a matrix, Rank of matrix, Normal form, Inverse of a matrix using elementary operations, Consistency and solutions of systems of linear equations using elementary operations, Linear dependence and independence of vectors, Concept & Properties of different matrices (unitary, orthogonal, symmetric, skew-symmetric, hermitian, skew-hermitian), Eigen values and Eigen vectors of a square matrix (of order 2 or 3), Characteristic polynomials, Caley-Hamilton theorem and its applications, Reduction to diagonal form (upto 3rd order).

MODULE II [10L]

Calculus-I (Functions of single variable): Rolle's theorem, Mean value theorem- Lagrange & Cauchy, Taylor's and Maclaurin's theorems, Expansion of simple functions by Taylor's and Maclaurin's Theorems, Fundamental theorem of integral calculus, Evaluation of plane areas, volume and surface area of a solid of revolution and lengths, Convergence of Improper integrals, Beta and Gamma Integrals - Elementary properties and the Inter relations.

MODULE III [12L]

Calculus-II (Functions of several variables): Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives, Total Differentiation, Derivatives of composite and implicit functions, Euler's theorem on homogeneous functions, Chain rule, Maxima and minima of functions of two variables – Lagrange's method of Multipliers, Change of variables-Jacobians (up to three variables), Double and triple integrals.

MODULE IV [8L]

Vector Calculus: Scalar and vector triple products, Scalar and Vector fields, Vector Differentiation, Level surfaces, Directional derivative, Gradient of scalar field, Divergence and Curl of a vector field and their physical significance, Line, surface and volume integrals, Green's theorem in plane, Gauss Divergence theorem, Stokes' theorem, Applications related to Engineering problems.

Text Books:

1. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley, 1999.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.
3. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. 2008.
4. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley, 1995.
5. G. Strang, Linear algebra and its applications (4th Edition), Thomson, 2006.

Reference Books:

1. S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India, 2000.
2. M. Apostol, Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.
3. TG. B. Thomas and R. L. Finney, Calculus and Analytic Geometry (9th Edition), ISE Reprint, Addison-Wesley, 1998.
4. Hughes-Hallett et al., Calculus-Single and Multivariable (3rd Edition), John-Wiley and Sons, 2003.
5. J. Stewart, Calculus (5th Edition), Thomson, 2003.
6. J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier,2006.
7. L.Rade and B.Westergen, Mathematics Handbook: for Science and Engineering (5th edition, 1st Indian Edition), Springer, 2009.
8. Murray R Spiegel and Seymour Lipschutz, Schaum's Outline of Vector Analysis.
9. Richard Bronson , Schaum's Outline of Matrix Operations.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PHYSICS –I**
SUBJECT CODE	**:**	**PH101**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1st Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Knowledge of Physics up to 12th standard. Elementary idea of theory of reflection, refraction and interference, Differential and integral calculus, Quantization of Energy and Inadequacy of classical mechanics are necessary.

Course Objective:

The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

Course Outcome
After completion of the course students will be able to

PH 101.1 : Define
- De-Broglie hypothesis, and Heisenberg's Uncertainty Principle
- Amplitude and Velocity Resonance
- Malus's Law, Brewster's Law
- Characteristics of LASER light
- Intrinsic and extrinsic semiconductor.

PH 101.2 : Explain
- Polarizer and analyzer
- basic principles and different types of LASER and Optical Fibre
- structure of solids, Miller indices
- theory of Matter Wave, equation of motion of Matter Wave
- wave function and its role in representing wave nature of matter
- p-n junction.

PH 101. 3 : Apply the knowledge of
- mechanical vibration in electrical circuits
- superposition principle in Newton's ring phenomenon, diffraction phenomenon
- quantum nature of e.m. waves for production of laser
- total internal reflection in transmitting light through optical fibres
- x-ray diffraction in crystal structure
- probability interpretation in Heisenberg's uncertainty principle

PH 101.4 : Analyze
- grating as many slit system
- role of Q factor in a resonating circuit, conditions of different types of resonance
- minimum requirements for lasing action
- importance of light as a carrier of information
- the failures of classical physics in microscopic situation and need of quantum physics
- Einstein's A, B coefficient and predict the wavelength domain of Lasing action

- Requirement of Miller indices for describing crystallographic planes

PH 101.5 : Judge

- X-ray production process is inverse of the process of Photoelectric Effect.
- different crystallographic structures according to their Co-ordination number and packing factors
- the outcome of Photo-electric effect, Compton effect and Davission-Germer experiment to justify wave-particle duality of matter

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH101.1	3											2
PH101.2	3											2
PH101.3	3	2										1
PH101.4	2	3										1
PH101.5	1	3										1

Course Contents:

MODULE I [8L]

Oscillations: Simple harmonic motion: Concepts with examples, Superposition of SHMs in two mutually perpendicular directions: Lissajous' figures, Engineering Applications and related Numerical problems.

Damped vibration: Differential equation and its solution, Logarithmic decrement, quality factor, Engineering Applications and related Numerical problems.

Forced vibration: Differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance, relevant applications including LCR circuits, Numerical problems.

MODULE II [9L]

Classical Optics: Interference of light: Wave nature of light (Huygen's principle), Conditions of sustained interference double slit as an example; qualitative idea of spatial and temporal coherence, conservation of energy and intensity distribution; Newton's ring (qualitative descriptions of working principles and procedures-no deduction required). Engineering applications, Numerical Problems.

Diffraction of light: Fresnel and Fraunhofer class, Fraunhofer diffraction for plane transmission grating (elementary treatment of intensity distribution for N-slits), single slit and double slits as examples, missing order, Rayleigh criterion, resolving power of grating and microscope (Definition and formula; no deduction required). Engineering Applications, Numerical Problems.

Polarization: Definition, plane of polarization, plane of vibration, Malus law, fundamental concepts of plane, circular and elliptical polarizations (only qualitative idea) with examples, Brewster's law, Double refraction: ordinary and extraordinary rays, Nicol's prism, Engineering applications, Numerical problems.

MODULE III[9L]

Quantum Physics: Quantum Theory: Inadequacy of classical physics; Planck's quantum hypothesis-Qualitative (without deductions), particle concept of electromagnetic wave (example: photoelectric and Compton effect; qualitative discussions only), wave particle duality; phase velocity and group velocity; de Broglie wave; Davisson and Germer experiment.

Quantum Mechanics 1: Concept of wave function, Physical significance of wave function, Probability interpretation; wave function normalization condition and its simple numerical applications; uncertainty principle-applications, Schrödinger equation (no mathematical derivation).

MODULE IV [6L]
X-ray & Crystallography : X-rays – Origin of Characteristic and Continuous X-ray, Bragg's law (No derivation), Determination of lattice constant, Applications, Numerical problems. Elementary ideas of crystal structure: lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, fcc and bcc, hcp lattices, (use of models in the class during teaching is desirable) Miller indices and miller planes, Co-ordination number and Atomic packing factor, Applications, Numerical problems.

MODULE V [8L]
Modern Optics-I:
Laser: Concepts of various emission and absorption process, working principle of laser, metastable state, Population Inversion, condition necessary for active laser action, optical resonator, ruby laser, He-Ne laser, semiconductor laser, Einstein A and B coefficients and equations, industrial and medical applications of laser.
Fibre optics and Applications: Principle and propagation of light in optical fibres- Numerical aperture and Acceptance angle, V number, Types of optical fibres (material, refractive index, mode), Losses in optical fibre- attenuation, dispersion, bending, Numerical problems.

Text Books :

Oscillations:
1. Classical Mechanics- J. C. Upadhyay (Himalya Publishers)
2. Classical Mechanics-Shrivastav
3. Classical Mechanics-Takwal & Puranik (TMH)
4. Sound-N. K. Bajaj (TMH)
5. Advanced Acoustics-D. P. Roy Chowdhury (Chayan Publisher)
6. Principles of Acoustics-B.Ghosh (Sridhar Publisher)
7. A text book of sound-M. Ghosh (S. Chand publishers)
8. Electricity Magnetism-Chattopadhyay & Rakshit (New Central Book Agency)
9. A text book of Light- K.G. Mazumder & B.Ghoshs, (Book & Allied Publisher)
10. R.P. Singh (Physics of Oscillations and Waves)
11. A.B. Gupta (College Physics Vol. II)
12. Chattopadhya and Rakshit (Vibration, Waves and Acoustics)

Classical Optics & Modern Optics-I:
13. A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)
14. A text book of Light-Brijlal & Subhramanium, (S. Chand publishers)
15. Modern Optics-A. B. Gupta (Book & Allied Publisher)
16. Optics-Ajay Ghatak (TMH)
17. Optics-Hecht
18. Optics-R. Kar, Books Applied Publishers
19. Möler (Physical Optics)
20. E. Hecht (Optics)
21. E. Hecht (Schaum Series)
22. F.A. Jenkins and H.E White
23. C.R. Dasgupta (Degree Physics Vol 3)

Quantum Physics
24. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
25. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
26. Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)
27. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)
28. Quantum Mechanics-Bransden (Pearson Education Ltd.)
29. Perspective of Modern Physics-A. Beiser (TMH)

30. Eisberg & Resnick is published by Wiley India
31. A.K. Ghatak and S Lokenathan
32. E.E. Anderson (Modern Physics)
33 .Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India
34. Binayak Dutta Roy [Elements of Quantum Mechanics]

X-ray & Crystallography

35. Solid state physics-Puri & Babbar (S. Chand publishers)
36. Materials Science & Engineering-Kakani Kakani
37. Solid state physics- S. O. Pillai
38. Introduction to solid state physics-Kittel (TMH)
39. Solid State Physics and Electronics-A. B. Gupta, Nurul Islam (Book & Allied Publisher)
40. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)

General Reference:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
3. Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)
4. Engineering Physics Vol: 1-Sudipto Roy, Tanushri Ghosh, Dibyendu Biswas (S. Chand).
5. Engineering Physics Vol:1-S. P. Kuila (New Central)
6. University Physics-Sears & Zemansky (Addison-Wesley)
7. B. Dutta Roy (Basic Physics)
8. R.K. Kar (Engineering Physics)
9. Mani and Meheta (Modern Physics)
10. Arthur Baiser (Perspective & Concept of Modern Physics)

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **BASIC ELECTRONICS ENGINEERING**
SUBJECT CODE : **EC101**
YEAR : **FIRST**
SEMESTER : **1^{st} Semester**
CONTACT HOURS : **3L + 1T**
CREDITS : **4**

Prerequisite:
Electric current and voltage-D.C and A.C., Complex impedance, conductivity, resistivity, transformer, charging and discharging of capacitor, active and passive elements.

Course Objective:
Students will be able to Analyze the behaviour of semiconductor diodes in Forward and Reverse bias . To design a half wave and full wave rectifiers, Explore V-I characteristics of Bipolar Junction Transistor n CB, CE & CC configurations. To acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amps. Students will be able to explain feedback concept and different oscillators . They will also be familiar with the analysis of digital logic basics and measuring Electronic devices. Students will have knowledge about characteristics of FET.

Course Outcome
On successful completion of the learning sessions of the course, the learner will be able to:

EC101.1: Demonstrate the concept of Conductors, Insulators, and Semiconductors based on energy-band theory and analyze relevant problems
EC101.2: Explain the working principles of P-N Junction Diode, zener diode and analyze their applications in the rectifier, clipper, clamper, regulator etc.
EC101.3: Analyze characteristics of bipolar junction transistor (BJT) under CE, CE, CC mode of operation and its biasing therein
EC101.4: Distinguish the operations of JFET, MOSFET and demonstrate their operations under CG, CS, CD configurations
EC101.5: Determine parameters in Operational Amplifier circuit design for various applications

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC101.1	3	3	2		1		3		2	2		3
EC101.2	3	3	2		1	2		2			3	3
EC101.3	3	3	3	1		3	2				2	3
EC101.4	3	3	3		2			1		3		3
EC101.5	3	3		2		2		1				3

Course Contents:

MODULE I [6L]
Basics of semiconductor: Conductors, Insulators, and Semiconductors- crystal structure, Fermi Dirac function, Fermi level, E-k and Energy band diagrams, valence band, conduction band, and band gap; intrinsic, and extrinsic (p-type and n-type) semiconductors, position of Fermi level in intrinsic and extrinsic semiconductor, drift and diffusion current – expression only (no derivation), mass action law , charge neutrality in semiconductor, Einstein relationship in semiconductor, Numerical problems on- Fermi level, conductivity, mass action law, drift and diffusion current.

MODULE II [8L]
P-N Junction Diode and its applications: p-n junction formation and depletion region , energy band diagram of p-n junction at equilibrium and barrier energy , built in potential at p-n junction , energy band diagram and current through p-n junction at forward and reverse bias, V-I characteristics and current expression of diode , temperature dependencies of V-I characteristics of diode , p-n junction breakdown – conditions , avalanche and Zener breakdown , Concept of Junction capacitance, Zener diode and characteristics. Diode half wave and full wave rectifiers circuits and operation (IDC, Irms, VDc ,Vrms), ripple factor without filter, efficiency ,PIV,TUF; Reduction of ac ripples using filter circuit (Qualitative analysis); Design of diode clipper and clamper circuit - explanation with example, application of Zener diode in regulator circuit. Numerical problems.

MODULE III [6L]
Bipolar junction transistor (BJT): Formation of PNP/NPN Transistors ,energy band diagram, current conduction mechanism, CE,CB,CC configurations , transistor static characteristics in CE,CB and CC mode, junction biasing condition for active, saturation and cut-off modes, current gain α ,β and γ, early effect. Biasing and bias stability; biasing circuits - fixed bias; voltage divider bias; collector to base bias, D.C. load line and Quiescent point, calculation of stability factors for different biasing circuits. BJT as an amplifier and as a switch – Graphical analysis; Numerical Problems.

MODULE IV [4L]
Field effect transistor (FET):Concept of field effect, channel width modulation Classification of FETs-JFET, MOSFET, operating principle of JFET. Drain and transfer characteristics of JFET (n-channel and p-channel), CS, CG, CD configurations, Relation between JFET parameters. FET as an amplifier and as a switch– graphical analysis. E-MOSFET (n-channel and p-channel), D-MOSFET (n-channel and p-channel), Numerical Problems.

MODULE V [10L]
Feedback and Operational Amplifier: Concept of feedback with block diagram, positive and negative feedback, gain with feedback. Feedback topologies, effect of feedback on input and output impedance, distortion, concept of oscillation and Barkhausen criterion. Operational amplifier – electrical equivalent circuit, ideal characteristics, Non ideal characteristics of op-amp – offset voltages; bias current ;offset current; Slew rate ; CMRR and bandwidth, Configuration of inverting and non-inverting amplifier using Op-amp, closed loop voltage gain of inverting and non-inverting amplifier , Concept of virtual ground, Applications op-amp – summing amplifier; differential amplifier; voltage follower ; basic differentiator and integrator.

Problems on Characteristics of Op-amp, CMRR, slew rate, amplifier and application of Op-amp to be discussed. Any other relevant problems related to topic may be discussed or assigned.

MODULE VI[2L]
Cathode Ray Oscilloscope (CRO):Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

MODULE VII [4L]
Digital Electronics : Binary numbers and conversion, Basic Boolean algebra, Logic gates (AND, OR, NOR, NOT, NAND, XOR) and realization of functions.

Text Books:

1. D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
2. Millman&Halkias, Integrated Electronics, Tata McGraw Hill.
3. Boyelstad&Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.

4. Sedra& Smith, Microelectronics Engineering

Reference Books:

1. John D. Ryder, Electronic Fundamentals and Applications, PHI
2. J.B.Gupta, Basic Electronics, S.K. Kataria.
3. Malvino: Electronic Principle.
4. Schilling &Belove: Electronics Circuits.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**ENGINEERING MECHANICS**
SUBJECT CODE	:	**ME101**
YEAR	:	**FIRST**
SEMESTER	:	**1st Semester**
CONTACT HOURS	:	**3L + 1T**
CREDITS	:	**4**

Prerequisite:

Knowledge of Physics, Chemistry & Mathematics in 10+2 standards

Course Objective:

To develop the concept of force, equilibrium, moment and their interrelationships when applied to bodies at static and dynamic conditions.

Course Outcome

On successful completion of the learning sessions of the course, the learner will be able to:

ME101.1: Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.

ME101.2: Study the effect of friction in static and dynamic conditions.

ME101.3: Understand the different surface properties, property of masses and material properties.

ME101.4: Analyze and solve different problems of kinematics and kinetics.

CO-PO Mapping

	PO 1	PO2	PO3	PO4	PO5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2
ME101.1	3	3	2	2					1			
ME101.2	3	3	2	2					1			1
ME101.3	3	2	3	2	1				1			1
ME101.4	3	3	3	3					1		1	

Course Contents:

MODULE I [10L]:

Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector). Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications. Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces.

MODULE II [7L] :

Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium. Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction.

MODULE III [10L]:

Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadralateral, composite areas consisting of above figures. Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone. Principle of virtual work with simple application Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.

MODULE IV [7L]

Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion).

MODULE V [7L]

Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy ; Principle of conservation of energy; Power and efficiency.

Text Books :

1. Engineering Mechanics [Vol-I & II]by Meriam & Kraige, 5th ed. – Wiley India
2. Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI
3. Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. – TMH
4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P

Reference Books:

10. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– Chhaya Prakashani
11. Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.
12. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11^{th} ed. – Pearson.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMMUNICATIVE ENGLISH**
SUBJECT CODE	**:**	**HU101**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1st Semester**
CONTACT HOURS	**:**	**2L**
CREDITS	**:**	**2**

Prerequisite:

Basic knowledge of high school English.

Course Objective:

Designed to meet the basic survival needs of communication in the globalized workplace, including knowledge of and competency in the use of macroskills in reading and writing proficiency, functional grammar and usage.

Course Outcome

On successful completion of the learning sessions of the course, the learner will be able to:

HU101.1: Able to comprehend and communicate in English through exposure to communication skills theory and practice.

HU101.2: Apply the basic grammatical skills of the English language through intensive practice.

HU101.3: Able to develop reading and comprehension skills.

HU101.4: Able to develop writing proficiency skills by writing Official Letters, Technical report, memo, notice, minutes, agenda, resume, curriculum vitae.

HU101.5: Able to apply all sets of English language and communication skills in creative and effective ways in the professional sphere of their life

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU101.1			1			1		1	3	3	3	3
HU101.2						2			2	3	3	3
HU101.3		3	2	2		3	2	2	3	3	3	3
HU101.4				2		2			3	3	2	3
HU101.5		2	1			2	2	1	3	3	2	3

Course Contents:

MODULE I [5L]

Communication: Interface in a Globalized World **:** Definition of Communication& Scope of Communication, Process of Communication—Models and Types, Verbal—Non-Verbal Communication, Channels of Communication, Barriers to Communication & surmounting them [to be delivered through case studies involving intercultural communication]

MODULE II [5L]

Vocabulary and Reading: Word origin—Roots, Prefixes and Sufffixes, Word Families, Homonyms and Homophones, Antonyms and Synonyms, One word substitution, Reading—Purposes and Skills, Reading Sub-Skills—Skimming, Scanning, Intensive Reading Comprehension Practice (Fiction and Non fictional Prose/Poetry)

MODULE III [6L]

Functional Grammar and Usage: Articles, Prepositions, Verbs, Verb-Subject Agreement, Comparison of Adjectives, Tenses and their Use, Transformation of Sentences, Error Correction

MODULE IV [10L]

Business Writing : Business Communication in the Present-day scenario, Business Letters (Letters of Inquiry, Sales Letters, Complaint and Adjustment Letters, Job Application Letters), Drafting of a CV and Résumé, Memo, Notice, Advertisement, Agenda, Minutes of Meetings, E-mails (format, types, jargons, conventions)

Texts:

1. Isaac Asimov, I Robot
2. George Orwell, Shooting an Elephant
3. Ruskin Bond, The Cherry Tree OR The Night Train at Deoli
4. Robert Frost, "Stopping by the Woods on a Snowy Evening."f. Precis Writing

References:

1.Raymond Murphy. English Grammar in Use. 3rd Edn. CUP, 2001.
2. Seidl & McMordie. English Idioms& How to Use Them. Oxford:OUP, 1978.
3. Michael Swan. Practical English Usage. Oxford:OUP, 1980.
4. Simeon Potter. Our Language. Oxford:OUP, 1950.
5. Pickett, Laster and Staples. Technical English: Writing, Reading & Speaking. 8th ed. London: Longman, 2001.
6. IIT Kanpur, English Language & Communication Skills (ENG 112 C) syllabus.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : PHYSICS-I LAB
SUBJECT CODE : PH191
YEAR : FIRST
SEMESTER : 1^{st} Semester
CONTACT HOURS : 3P
CREDITS : 2

Perquisite: Knowledge of Physics upto 12^{th} standard.

Course Objective:
To develop conceptual understanding of database management system for solving different industry level problems & to learn its applications

Course Outcome:
After completion of this course student will be able to

PH191.1: Define, understand and explain
- ✓ Error estimation, Proportional error calculation
- ✓ superposition principle in Newton's ring, Fresnel's biprism, laser diffraction
- ✓ Basic circuit analysis in LCR circuits

PH191.2: Conduct experiments using
- ✓ LASER, Optical fibre
- ✓ Interference by division of wave front, division of amplitude, diffraction grating, polarization of light
- ✓ Quantization of electronic energy inside an atom
- ✓ Torsional pendulum
- ✓

PH191.3: Able to participate as an individual and as a member or leader in groups in laboratory sessions actively

PH191.4: Ability to analyze experimental data from graphical representations and to communicate effectively them in Laboratory reports including innovative experiments

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH191.1	3	2										1
PH191.2	1	2		3								1
PH191.3	1	2							3			1
PH191.4	1	2								3		1

Course Contents:

MODULE I:
General idea about Measurements and Errors (One Mandatory):
- ✓ Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
- ✓ Proportional error calculation using Carrey Foster Bridge.

MODULE II:
Experiments on Oscillations & Elasticity:
- ✓ Study of Torsional oscillation of Torsional pendulum & determination of time period using various load of the oscillator.
- ✓ Experiments on Lissajous figure (using CRO).
- ✓ Experiments on LCR circuit.

- ✓ Determination of elastic modulii of different materials (Young's modulus and Rigidity modulus)

MODULE III:
Experiments on Optics:
- ✓ Determination of wavelength of light by Newton's ring method.
- ✓ Determination of wavelength of light by Laser diffraction method.
- ✓ Determination of numerical aperture and the energy losses related to optical fibre experiment
- ✓ Measurement of specific rotation of an optically active solution by polarimeter.

MODULE IV:
Experiments on Quantum Physics:
- ✓ Determination of Planck's constant using photoelectric cell.
- ✓ Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.

**In addition it is recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:
- ✓ Determination of wavelength of light by Fresnel's bi-prism method (beyond the syllabus).
- ✓ Study of half-wave, quarter-wave plate (beyond the syllabus)
- ✓ Study of dispersive power of material of a prism.
- ✓ Study of viscosity using Poyseullie's caplillary flow method/using Stoke's law.
- ✓ Measurement of nodal and antinodal points along transmission wire and measurement of wave length.
- ✓ Any other experiment related to the theory.

Text Books:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
3. Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)
4. Engineering Physics Vol: 1-Sudipto Roy, Tanushri Ghosh, Dibyendu Biswas (S. Chand).
5. Engineering Physics Vol:1-S. P. Kuila (New Central)

Reference Books:

6. University Physics-Sears & Zemansky (Addison-Wesley)
7. B. Dutta Roy (Basic Physics)
8. R.K. Kar (Engineering Physics)
9. Mani and Meheta (Modern Physics)
10. Arthur Baiser (Perspective & Concept of Modern Physics)

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BASIC ELECTRONICS ENGINEERING LAB**
SUBJECT CODE	**:**	**EC191**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1st Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm's law, Ampere's law.

Course Objective:
Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias; able to design rectifiers like half wave, full wave rectifiers etc. using diodes. The ability of circuit design with Bipolar Junction Transistor in CB, CE & CC configurations will be improved; will acquire the basic engineering technique and ability to design and analyze the circuits of OpAmp. Basic concepts and Circuit design with logic gates will be developed in the students. The students will be able design circuit using FET.

Course Outcome
After completion of this course student will be able to

EC191.1: Identify different types of passive and active electronic components, apply signals through signal generators and measure signals using CRO, Multimeter etc

EC191.2: Demonstrate and analyze the characteristics for PN junction diode, Zener diode.

EC191.3: Describe the regulator circuit and analyze the parametric observation

EC191.4: Demonstrate and analyze the characteristics for BJT, FET.

EC191.5: Explain the limits on observation of various parameters of OP-AMP.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC191.1	3	3	2		1		3		2			3
EC191.2	3	3	2		1	2		2				3
EC191.3	3	3		1		3	2			3		3
EC191.4	3	3	3		2			1				3
EC191.5	3	3		2		2		1		2		3

Course Contents:

List of Experiments:

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, millimetres etc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.
7. Study of I-V characteristics of Field Effect Transistors.
8. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
9. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.

10.Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
11. Study of Logic Gates and realization of Boolean functions using Logic Gates.
12. Study of Characteristic curves for CB, CE and CC mode transistors.
13. Innovative Experiment.

Text Books:

5. D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
6. Millman&Halkias, Integrated Electronics, Tata McGraw Hill.
7. Boyelstad&Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.
8. Sedra& Smith, Microelectronics Engineering

Reference Books:

1. John D. Ryder, Electronic Fundamentals and Applications, PHI
2. J.B.Gupta, Basic Electronics, S.K. Kataria.
3. 3.Malvino: Electronic Principle.
4. Schilling &Belove: Electronics Circuits.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : WORKSHOP PRACTISE
SUBJECT CODE : ME192
YEAR : FIRST
SEMESTER : 1st Semester
CONTACT HOURS : 3P
CREDITS : 2

Perquisite: Higher Secondary with Physics, Chemistry & Mathematics.

Course Objective:
To understand the basic knowledge of Workshop Practice and Safety; identify and use of different hand tools and other instruments like Hand Saw, Jack Plane, Chisels etc and operations like such as Marking, Cutting etc used in manufacturing processes; to get hands on practice in various machining metal joining processes such as Welding, Brazing, Soldering, etc.

Course Outcome:
After completion of this course student will be able to

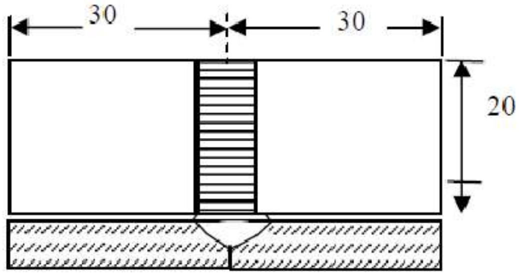
ME192.1	Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
ME192.2	Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and performing operations like such as Marking, Cutting etc used in manufacturing processes.
ME192.3	Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
ME192.4	Get hands on practice of in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME192.1	2					2		1			1	
ME192.2	2					1		2				
ME192.3	2					1		1				
ME192.4	1				1	3		3				1

Course Contents:

MODULE I: Pattern Making



MODULE II: Sheet Metal Work

MODULE III: Fitting

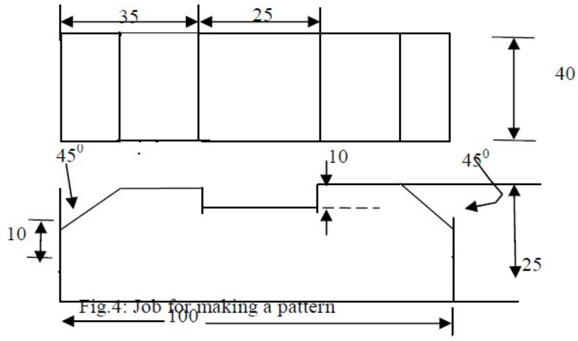


Fig.4: Job for making a pattern

MODULE IV: Machining in Lathe

MODULE V: Welding

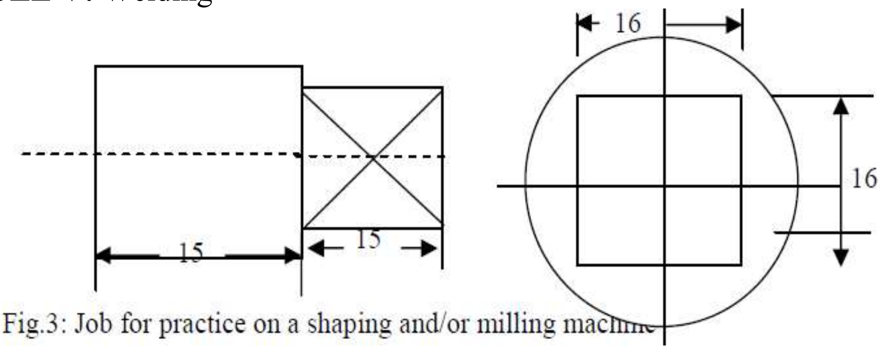


Fig.3: Job for practice on a shaping and/or milling machine

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : LANGUAGE LAB AND SEMINAR PRESENTATION
SUBJECT CODE : HU191
YEAR : FIRST
SEMESTER : 1st Semester
CONTACT HOURS : 3P
CREDITS : 2

Perquisite: Basic knowledge of LSRW skills.

Course Objective:
To train the students in acquiring interpersonal communication skills by focussing on skill acquisition techniques and error feedback.

Course Outcome:
After completion of this course student will be able to

HU191.1 Able to understand advanced skills of Technical Communication in English through Language Laboratory.
HU191.2 Able to apply listening, speaking, reading and writing skills in societal and professional life.
HU191.3 Able to demonstrate the skills necessary to be a competent Interpersonal communicator.

HU191.4 Able to analyze communication behaviors.
HU191.5 Able to adapt to multifarious socio economical and professional arenas with the help of effective communication and interpersonal skills.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU191.1	2			3		3	2	2	3	3		3
HU191.2	2	3	3	3		3	3	3	2	3		3
HU191.3	1	3	3	3		2	2	2	2	3		2
HU191.4	1	2	3	3		2	1	1	2	3		2
HU191.5	3	3	2	3		2	3	2	2	3		2

Course Contents:

MODULE I:
Introduction to the Language Lab
a. The Need for a Language Laboratory
b. Tasks in the Lab
c. Writing a Laboratory Note Book

MODULE II :
Active Listening
a. What is Active Listening
b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note taking
c. Contextualized Examples based on Lab Recordings

MODULE III:
Speaking
a. Speaking and what it involves

b. Language Functions/Speech Acts
c. Speaking using Picture Prompts and Audio Visual inputs
c. Conversational Role Plays
d. Group Discussion: Principles and Practice

MODULE IV:
Lab Project Work
a. Keeping a Listening Log
b. Writing a Film Review/Advertisements

References:

1. IIT Mumbai, Preparatory Course in English syllabus
2. IIT Mumbai, Introduction to Linguistics syllabus
3. Sasikumar et al. A Course in Listening and Speaking. New Delhi: Foundation Books, 2005.
4. Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.

2ND SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MATHEMATICS-II**
SUBJECT CODE	**:**	**M201**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2^{nd} Semester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:

Any introductory course on calculus.

Course Objective:

The purpose of this course is to provide fundamental concepts Ordinary Differential Equations, Graph Theory and Laplace Transform.

Course Outcome

After completion of this course student will be able to

M201.1: Recall the distinctive characteristics of Ordinary Differential Equations, Graph Theory and Laplace Transform to analyze the problems in Science & Technology.

M201.2: Demonstrate the theoretical concept of Ordinary Differential Equations, Graph Theory and Laplace Transform and understand the related working principles to solve the problems in Science & Technology.

M201.3: Develop mathematical model of various real world scenarios using concepts of Ordinary Differential Equations, Graph Theory and Laplace Transform and solve the same, judge if the results are reasonable, and then interpret and clearly communicate the results.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M201.1	3	2										1
M201.2	3	2										1
M201.3	3	2	2									1

Course Contents:

Module I : [10L]

Ordinary differential equations (First order): First order and first degree Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation, General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation), Applications related to Engineering problems.

Module II: [10L]

Ordinary differential equations (Higher order): General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations, Solution of simultaneous linear differential equations, Applications related to Engineering problems.

Module III: [10L]

Basic Graph Theory: Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph, Walks, Paths, Circuits, Euler Graph, Cut-sets and cut-vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph. Tree, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using Kruskal's and Prim's algorithm.

MODULE IV: [10L]

Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of t f (t), LT of f (t)/t , LT of derivatives of f (t), L.T. of $\int f(u)\,du$. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT. Applications related to Engineering problems.

Beyond Syllabus:

Combinatorics: Fundamental Principles, Permutations, Combinations, Binomial Coefficients.

Text Books:

1. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley, 1999.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.
3. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, 2008.

Reference Books:

1. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley, 2005.
2. R.K. Ghosh and K.C.Maity, An Introduction to Differential Equations, New Central Book Agency.
3. V. K. Balakrishnan,Graph Theory, Schaum's Outline, TMH.
4. J. Clark and D. A. Holton, A first course at Graph Theory,Allied Publishers LTD.
5. D. B. West, Introduction to Graph Theory,Prentice-Hall of India.
6. N. Deo, Graph Theory, Prentice-Hall of India.
7. J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier, 2006.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**CHEMISTRY**
SUBJECT CODE	**:**	**CH201**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2^{nd} Semester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:

Knowledge of Chemistry in 10+2 standards

Course Objective:

Understanding of the fundamental theories and applications of thermodynamics, electrochemical principles in modern electrochemical cells and to get an insight into electronic structure of crystals and nano materials. Learning about the Synthesis, properties and applications of polymers, fuels and alternative energy sources & their significance in petrochemical industries. Analyzing water quality for its various parameters & its significance in industries

Course Outcome
After completion of this course student will be able to

CH201.1: Apply fundamental concepts of thermodynamics in different engineering applications.

CH201.2: Apply the knowledge of chemical reactions and chemistry of fuel to industries, scientific and technical fields.
CH201.3: Design different types of cell and semiconductor based devices.
CH201.4: Apply the knowledge of corrosion to prevent different metals from Corrosion.
CH201.5: Identify different types of Organic reaction from the basic concept of Organic Chemistry
CH201.6: Prepare different types polymer materials as per their application.
CH201.7: Solve the industrial problem from the concept of nano science and water quality parameter

CO-PO Mapping

	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CH201.1	3	3	2									
CH201.2	2	3	1									
CH201.3	3	3	2	1								
CH201.4	2	2										
CH201.5	3	1										
CH201.6	3	2	3									
CH201.7	3	2	2									

Course Contents:

Module 1: [8L]
Chemical Thermodynamics–I : Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property. Introduction to first law of thermodynamics: Different statements, mathematical form. Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas. Enthalpy: Definition, Characteristics, Physical

significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. Heat Capacity: Definition, Classification of Heat Capacity (Cp and CV): Definition and General expression of Cp - CV. Expression of Cp - CV for ideal gas. Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas, Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process. Application of first law of thermodynamics to chemical processes: exothermic, endothermic. 2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature (brief). Evaluation of entropy: characteristics and expression, physical significance. Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas, standard free energy and chemical potential, Condition of spontaneity and equilibrium reaction.

Module 2: [7L]

Reaction Dynamics: Reaction laws: rate and order; molecularity; zero and first order kinetics, second order kinetics (same reactant concentration), Pseudo uni molecular reaction, Arrhenius equation. Mechanism and theories of reaction rates (Content beyond the syllabus) Solid state Chemistry: Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency). Role of silicon and germanium in the field of semiconductor, n-type, p-type semiconductor, photo voltaic cell, fabrication of integrated circuits.

Module 3: [8L]

Electrochemistry: Conductance, Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). Electrochemical cell: Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, calomel half cell (representation, cell reaction, expression of potential, Discussion, Application). Concept of battery: Battery and Commercial electrochemical cell: Dry cell, acid storage cell, alkaline storage cell, fuel cell (construction, representation, cell reaction, expression of potential, discussion, application). Corrosion and its control: Introduction, cause and effect of corrosion, types of corrosion: dry, wet and other: Electrochemical corrosion, galvanic corrosion, passivation and protective measure.

Module 4 [12L]

Structure and reactivity of Organic molecule: Electro negativity, electron affinity, hybridisation, Inductive effect, resonance, hyper conjugation, electromeric effect, carbocation, carbanion and free radicals. Brief study of some addition, eliminations and substitution reactions. Polymers : Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg.: Theory and mathematical expression only), Poly disparity index (PDI). Polymerization processes: addition and condensation polymerization (mechanism not required), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of Tm) and amorphicity (Concept of Tg) of polymer. Preparation, structure and use of some common polymers: plastic (HDPE, LDPE, PVC, PP, PMMA, Polyester, PTFE, Bakelite), rubber (natural rubber, SBR), fibre (nylon 6, nylon 6,6), Vulcanization of rubber, Conducting polymers and bio-polymers. Nano-material: Basic principles of nano science and technology, classification, preparation, properties and application of nano-material.

Module 5 [5L]

Industrial Chemistry Fuel: Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Proximate analysis of coal, Calorific value. Liquid fuel: Petroleum, classification of petroleum, Refining, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Biodiesel. Gaseous fuels: Natural gas, water gas, Coal gas, bio gas, CNG, LPG. Water: Introduction, source of water, water quality parameter, specification for drinking water (BIS and WHO standards), Chlorination of Water, Types of hardness- Units, Brief Softening methods. Short overview of water treatment plants (Content beyond the syllabus)

Text Books:

1. Engineering Chemistry: Bandyopadhyay and Hazra
2. Physical Chemistry: P.C. Rakshit
3. Organic Chemistry: Finar, vol-1

Reference Books:

1. Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008
2. A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.
3. Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **BASIC ELECTRICAL ENGINEERING**
SUBJECT CODE : **EE201**
YEAR : **FIRST**
SEMESTER : **2nd Semester**
CONTACT HOURS : **3L+1T**
CREDITS : **4**

Prerequisite:
Knowledge of Physics and Mathematics in 10+2 standards

Course Objective:
Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and
frequency to understand the impact of technology in a global and societal context; provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices; to explain the working principle, construction, applications of DC machines, AC machines & measuring instruments; highlight the importance of transformers in transmission and distribution of electric power.

Course Outcome
After completion of this course student will be able to

EE201.1: Predict the behavior of any electrical and magnetic circuits.

EE201.2: Formulate and solve complex AC, DC circuits.

EE201.3: Identify the type of electrical machine used for that particular application.

EE201.4: Realize the requirement of transformers in transmission and distribution of electric power and other applications.

EE201.5: Function on multi-disciplinary teams.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE201.1	3	3										1
EE201.2	2	3	3									
EE201.3				3			2					
EE201.4		2	3				1					
EE201.5						1		2				

Course Contents:

DC CIRCUITS: [7L]
Definition of electric circuit, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, node, branch, active and passive elements, Kirchhoff's laws, Source equivalence and conversion, Network Theorems-Superposition Theorem, Thevenin's Theorem, Norton Theorem, Maximum Power Transfer Theorem, Star-Delta Conversions.

MAGNETIC CIRCUITS: [3L]
Concept of Magnetic circuit, B-H curve, Analogous quantities in magnetic and electric circuits, Faraday's law, iron losses, self and mutual inductance, Energy stored in magnetic field.

AC SINGLE PHASE CIRCUITS: [8L]
Sinusoidal quantities, Average and RMS values, peak factor, Form factor, Phase and Phase difference, concept of phasor diagram, V-I Relationship in R,L,C circuit, Combination R,L,C in AC series , parallel and series parallel circuits with phasor diagrams, impedance and admittance, Power factor, Power in AC circuit, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit.

THREE PHASE CIRCUITS: [3L]
Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method.

DC MACHINES: [6L]
Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Torque Equation ,Speed Torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control).

SINGLE PHASE TRANSFORMER: [5L]
Constructional parts, Types of transformers, Emf equation, No Load no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.

THREE PHASE INDUCTION MOTOR: [6L]
Types, Construction, production of rotating field, principle of operation, Slip and Frequency, rotor emf and current, Equivalent circuit and phasor diagram, Torque Slip characteristics torque-speed characteristics Starting of induction motor by star delta starter and(DOL starter). Speed Control of Three phase induction motor by variation of supply frequency, supply voltage and number of poles.

GENERAL STRUCTURE OF ELECTRICAL POWER SYSTEM: [3L]
Power generation to distribution through overhead lines and underground cables with single line diagram, Earthing of Electrical Equipment, Electrical Wiring Practice

Text books
1. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
2. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication
3. Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH
4. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books
1. H. Cotton, Willey Press
2. J.B. Gupta, Basic Electrical Engineering, Kataria & Sons .
3. Kothari & Nagrath, Basic Electrical Engineering, TMH

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : COMPUTER FUNDAMENTALS & PRINCIPLE OF COMPUTER PROGRAMMING
SUBJECT CODE : CS201
YEAR : FIRST
SEMESTER : 2nd Semester
CONTACT HOURS : 3L+1T
CREDITS : 4

Prerequisite:

Knowledge of Mathematics, Physics.

Course Objective:

The course is designed to provide complete knowledge of C language; students will be able to develop logics which will help them to create programs, applications; learners would be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

Course Outcome
After completion of this course student will be able to

CS201.1: Understands the concept of anatomy of computer and differentiate among different programming languages for problem solving.

CS201.2: Analyze real life problems and design algorithm.
CS201.3: Apply the concept of conditional and iterative statements to write C programs.
CS201.4: Execute arrays, functions, pointers, structures and apply these concepts to solve real time problems.
CS201.5: Create a significant project using the concept of C programming.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS201.1	3	2	1									
CS201.2	2	3	3	2								
CS201.3	2	3		2	2							
CS201.4	3	2	3	2	2							
CS201.5	3				3			1	2	1		3

Course Contents:

Fundamentals of Computer: [10L]
History of Computer, Generation of Computer, Classification of Computers. Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. Binary and Allied number systems representation of signed & unsigned numbers, BCD, ASCII, Binary number Arithmetic – Addition and Subtraction (using 1's complement and 2's complement). Logic gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR - only truth tables, logic gate symbols and logic equations for gates only. Assembly language, high level language, machine level language, compiler and assembler (basic concepts). Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX. Problem solving-Algorithm & flow chart

C Fundamentals: [33L]

Variable and Data Types:[3L]
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements

C Operators & Expressions:[5L]
Arithmetic operators, relational operators, logical operators, increment and decrement operators, bitwise operators, assignment operators, conditional operators, special operators - type conversion, C expressions, precedence and associativity. Input and Output: Standard input and output, formatted output - printf, formatted input scanf, bit fields

Branching and Loop Statements: [3L]
Statement and blocks, if - else, switch, goto and labels, Loops - while, for, do while, break and continue.

Fundamentals and Program Structures: [6L]
auto, external, static and register variables Functions, function types, function prototypes, functions returning values, functions not returning values, scope rules, recursion, C preprocessor and macro.

Arrays, Strings and Pointers: [9L]
One dimensional arrays, Two-dimensional arrays, Multidimensional arrays. Passing an array to a function Character array and string, array of strings, Passing a string to a function, String related functions Pointers, Pointer and Array, Pointer and String, Pointer and functions, Dynamic memory allocation.

Files handling with C:[4L]
formatted and unformatted files, Command line arguments, fopen, fclose, fgetc, fputc, fprintf, fscanf function

Structures and Unions: [3L]
Basic of structures, arrays of structures, structures and pointers, structures and functions

Text book:

1. Kerninghan B.W. & Ritchie D.M. - The C Programming Language
2. Gottfried - Programming with C Schaum
3. Balaguruswamy - Programming in C
4. Ram B. Computer Fundamentals, New Age International

Reference Books:

1. Pohl and Kelly - A Book on C
2. Kerninghan, B.W. - The Elements of Programming Style
3. Schied F.S. Theory and Problems of Computers and Programming
4. Rajaraman V. Fundamental of Computers
5. M.M.Oka Computer Fundamentals,EPH
6. Leon Introduction to Computers,Vikas
7. Kanetkar Y. - Let us C
8. Leon- Fundamental of Information Technology,Vikas
9. Ravichandran D. Programming in C, New Age International
10. Xavier C. Introduction to Computers, New Age International

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : ENGINEERING THERMODYNAMICS & FLUID MECHANICS
SUBJECT CODE : ME201
YEAR : FIRST
SEMESTER : 2nd Semester
CONTACT HOURS : 3L+1T
CREDITS : 4

Prerequisite:

Knowledge of Physics, Chemistry & Mathematics in 10+2 standards

Course Objective:
To understand the basic relationship of heat and work transfer for developing the primary concept of an engine.

Course Outcome
After completion of this course student will be able to

ME201.1: Know about thermodynamic equilibrium, heat & work transfer, First law and its application.

ME201.2: Understand the basic concepts of Heat Engine, Entropy from Second law of thermodynamics.

ME201.3: Know the thermodynamic characteristics of a pure substance and its application in power cycles (Simple Rankine cycles, Air Standard cycles)

ME201.4: Knowledge of basic principles of fluid mechanics, and ability to analyze fluid flow problems with the application of the momentum and energy equations.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME201.1	3	3	2	2		1	1	1	1		1	2
ME201.2	3	3	2	2		1	2		1		1	2
ME201.3	2	2	1	1		2	1					1
ME201.4	3	3	2	2		1	1				1	1

Course contents:

Module 1: [10L]
Basic Concepts of Thermodynamics: Introduction: Microscopic and Macroscopic viewpoints. Definition of Thermodynamic systems: closed, open and isolated systems Concept of Thermodynamics state; state postulate. Definition of properties: intensive, extensive & specific properties. Thermodynamic equilibrium. Thermodynamic processes; quasi-static, reversible & irreversible processes; Thermodynamic cycles. Zeroth law of thermodynamics. Concept of empirical temperature. Heat and Work: Definition & units of thermodynamic work. Examples of different forms of thermodynamic works; example of electricity flow as work. Work done during expansion of a compressible simple system. Definition of Heat; unit of Heat. Similarities & Dissimilarities between Heat & Work. Ideal Equation of State, processes; Real Gas. Definition of Ideal Gas; Ideal Gas Equations of State. Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes. Equations of State of Real Gases: Van der Waal's equation; Virial equation of state. Properties of Pure Substances: p-v, T-s & h-s

diagrams of pure substance like H_2O. Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status. Definition of dryness fraction of steam, degree of superheat of steam.

Module 2: [6L]
1st Law of Thermodynamics: Definition of Stored Energy & Internal Energy 1st Law of Thermodynamics for cyclic processes Non Flow Energy Equation. Flow Energy & Definition of Enthalpy. Conditions for Steady State Steady flow: Steady State Steady Flow Energy Equation.

Module 3: [8L]
2nd Law of Thermodynamics: Definition of Sink, Source Reservoir of Heat. Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators. Kelvin – Planck & Clausius statements of 2nd Law of Thermodynamics Absolute or Thermodynamic scale of temperature, Clausius Integral Entropy. Entropy change calculation for ideal gas processes. Carnot Cycle & Carnot efficiency. PMM-2; definition & its impossibility

Module 4: [8L]
Air standard Cycles for IC engines: Otto cycle; plot on P-V, T-S planes; Thermal efficiency Diesel cycle; plot on P-V, T-S planes; Thermal efficiency. Rankine cycle of steam: Chart of steam (Mollier's Chart). Simple Rankine cycle plot on P-V, T-S, h-s planes Rankine cycle efficiency with & without pump work (Problems are to solved for each module)

Module 5: [10L]
Properties & Classification of Fluids: Ideal & Real fluids, Newton's law of viscosity; Newtonian and Non-Newtonian fluids, Compressible and Incompressible fluids. Fluid Statics: Pressure at a point. Measurement of Fluid Pressure Manometers: simple & differential U-tube, Inclined tube. Fluid Kinematics: Stream line, Laminar & turbulent flow external & internal flow Continuity equation. Dynamics of ideal fluids: Bernoulli's equation, Total head; Velocity head; Pressure head Application of Bernoulli's equation. Measurement of Flow rate: Basic principles : Venturimeter, Pilot tube, Orificemeter

(Problems are to be solved for each module)

Text Books:

1 Engineering Thermodynamics - P K Nag, 4th edn, TMH.
2 Fluid Mechanics and Hydraulic Machines - R Bansal

Reference Books:

1 Fundamentals of Thermodynamics 6e by Sonntag & Van Wylin published by Wiley
2 Engineering Thermodynamics – Russel & Adeliyi (Indian edition), OUP
3 Engineering Thermodynamics – Onkar Singhh, New Age International Publishers Ltd.
4 Basic Engineering Thermodynamics – R Joel, 5th Ed., Pearson
5 Introduction to Fluid Mechanics and Fluid Machines - S.K.Som, G.Biswas. 2nd edn, TMH
6 Fluid Mechanics by A.K.Jain.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **CHEMISTRY LAB**
SUBJECT CODE : **CH291**
YEAR : **FIRST**
SEMESTER : **2nd Semester**
CONTACT HOURS : **3P**
CREDITS : **2**

Prerequisite:
Knowledge of Chemistry in 10+2 standards

Course Objective:
Acquiring knowledge on standard solutions and the various reactions in homogeneous and heterogeneous medium. Understanding the basic principles of pH meter and conductivity meter for different applications and analyzing water for its various parameters. Synthesis of Polymeric materials and Nano-materials.

Course Outcome
After completion of this course student will be able to
CH291.1: Measure water quality parameters like alkalinity, hardness and amount of dissolved oxygen, Chloride ions, iron etc. to be applied for industrial purpose.
CH291.2: Measure the conductivity and pH value of different solutions.
CH291.3: Fabricate polymer based materials (e.g. Bakelite) which is used to form electrical insulator parts.
CH291.4: Measure the oxidizing and reducing power of materials.

CH291.5: Synthesize nano particles for catalytic and medicinal activities.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CH291.1	3	3	3									
CH291.2	3	2	2									
CH291.3	3	1	3	2								
CH291.4	3	3	3									
CH291.5	3	2		3								

Course Contents:

List of Experiments:

1. To Determine the alkalinity in given water sample.
2. Redox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. Preparation of phenol-formaldehyde resin (Bakelite).
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
6. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
7. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.

8. Determination of dissolved oxygen present in a given water sample.
9. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution).

Innovative experiment:
Preparation of silver nano-particles.

Note: From the list of experiments a minimum of 7 (seven) experiments shall have to be performed by one student of which Sl. No. 4 (Preparation of Bakelite) has to be mandatory.

Text Books:

4. Engineering Chemistry: Bandyopadhyay and Hazra
5. Physical Chemistry: P.C. Rakshit
6. Organic Chemistry: Finar, vol-1

Reference Books:

4. Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008
5. A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.
6. Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**COMPUTER FUNDAMENTALS & PRINCIPLE OF COMPUTER PROGRAMMING LAB**
SUBJECT CODE	:	**CS291**
YEAR	:	**FIRST**
SEMESTER	:	**2nd Semester**
CONTACT HOURS	:	**3P**
CREDITS	:	**2**

Prerequisite:
Basic knowledge of computer

Course Objective:
To develop an understanding of the design, implementation, and compilation of a C program, to gain the knowledge about pointers, a fundamental for understanding data structure issues, to understand the usage of user defined data type for application development.

Course Outcome
After completion of this course student will be able to

CS291.1: Understand the concept of data types, loops, functions, array, pointers, string, structures and files.
CS291.2: Design flow-chart, algorithm and program logic.
CS291.3: Analyze problems, errors and exceptions.
CS291.4: Apply programming concepts to compile and debug c programs to find solutions.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS291.1	3											
CS291.2	2	3	3	2	2							
CS291.3	2	3	3	2	2							
CS291.4	3		3	2	2				2			3

Course Content:

List of Experiments (but not limited to):
1. Some basic commands of DOS, Windows and Linux Operating System, File handling and Directory structures, file permissions, creating and editing simple C program, compilation and execution of C program.
2. Writing C Programs on variable, expression, operator and type-casting.
3. Writing C Programs using different structures of if-else statement and switch-case statement.
4. Writing C Programs demonstrating use of loop (for loop, while loop and do-while loop) concept and use of break and continue statement.
5. Writing C Programs demonstrating concept of Single & Multidimensional arrays.
6. Writing C Programs demonstrating concept of Function and Recursion.
7. Writing C Programs demonstrating concept of Pointers, address of operator, declaring pointers and operations on pointers.
8. Writing C Programs demonstrating concept of structures, union and pointer to structure.

9. Writing C Programs demonstrating concept of String and command line arguments.
10. Writing C Programs demonstrating concept of dynamic memory allocation.
11. Writing C Programs demonstrating concept of File Programming.

Text book:

1. Kerninghan B.W. & Ritchie D.M. - The C Programming Language
2. Gottfried - Programming with C Schaum
3. Balaguruswamy - Programming in C

Reference Books:

1. Pohl and Kelly - A Book on C
2. Kerninghan, B.W. - The Elements of Programming Style
3. Schied F.S. Theory and Problems of Computers and Programming

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**BASIC ELECTRICAL ENGINEERING LAB**
SUBJECT CODE	:	**EE291**
YEAR	:	**FIRST**
SEMESTER	:	**2nd Semester**
CONTACT HOURS	:	**3P**
CREDITS	:	**2**

Prerequisite:
Knowledge of Mathematics and Physics in 10+2 standards

Course Objective:
Provide knowledge for the analysis of basic electrical circuit, to introduce electrical appliances, machines with their respective characteristics. The ability to conduct testing and experimental procedures on different types of electrical machines and to analyze the operation of electric machines under different loading conditions.

Course Outcome
After completion of this course student will be able to
EE291.1: Analyze the response of any electrical circuit and network
EE291.2: Troubleshoot the operation of an electrical apparatus
EE291.3: Select a suitable measuring instrument for a given application
EE291.4: Gain the knowledge of various parts and test of DC machine and transformer
EE291.5: Incorporate the measuring error with actual value and calibrate the instruments

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE291.1	1	2		2								
EE291.2		3		2					2			
EE291.3		3		3	1				2			
EE291.4		3		2								
EE291.5		2		3	1				2			

Course Content:

List of Experiments:
1. Characteristics of Fluorescent, Tungsten and Carbon filament lamps
2. Verification of Thevenin's and Norton's Theorem
3. Verification of Superposition Theorem
4. Calibration of Ammeter and Wattmeter
5. Study of R-L-C series circuit
6. Open circuit and short circuit test of a single phase Transformer
7. Starting, Reversing of a and speed control of D.C shunt motor
8. Test on single phase Energy Meter
9. Familiarization of PMMC and MI type Meter
10. Familiarization with house wiring practice

Text books

1. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
2. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication
3. Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH
4. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books

1. H. Cotton, Willey Press
2. J.B. Gupta, Basic Electrical Engineering, Kataria & Sons.
3. Kothari & Nagrath, Basic Electrical Engineering, TMH

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : ENGINEERING DRAWING & GRAPHICS
SUBJECT CODE : ME291
YEAR : FIRST
SEMESTER : 2nd Semester
CONTACT HOURS : 3P
CREDITS : 2

Prerequisite:
Knowledge of Physics, Mathematics in 10+2 standards

Course Objective:
To learn basics of drafting and use of drafting tools, know about engineering scales, dimensioning and various geometric curves, understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts and to acquire the knowledge of Computer Aided drafting using design software.

Course Outcome
After completion of this course student will be able to
ME291.1: Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
ME291.2: Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
ME291.3: Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
ME291.4: Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME291.1	2		1	2		1			1			1
ME291.2	3		2	2		1			1	1		1
ME291.3	2	2	2	1		1			1			1
ME291.4	1	-	2	2	2	1			1	1		1

Course Contents:

List of Experiments:
1. Lines, Lettering, Dimensioning, Scales (Plain scale & diagonal Scale).
2. Geometrical Construction and Curves – Construction of Polygons, Parabola, Hyperbola & ellipse
3. Projection of Points, Lines and Surfaces – orthographic projection- first angle and third angle projection, projection of lines and surfaces- Hexagon
4. Projection of Solids – (Cube, Pyramid, Prism, cylinder and Cone
5. Sectional Views – for simple sold objects

6. Introduction to Computer Aided Drafting – using auto cad & / or similar software- Introduction to Cartesian and polar coordinate systems, absolute and relative coordinates; Basic editing commands: line, point, trace, rectangle, polygon , circle, arc, ellipse, polyline; editing methods; basic object selection methods – window and crossing window, erase, move, copy, offset, fillet, chamfer, trim, extend, mirror; display command; zoom, pan, redraw, regenerate; simple dimensioning and text, simple exercises.

Text Books:

1. Engineering Chemistry: Bandyopadhyay and Hazra
2. Physical Chemistry: P.C. Rakshit
3. Organic Chemistry: Finar, vol-1

Reference Books:

1. Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008
2. A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.
3. Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : SOFT SKILL DEVELOPMENT
SUBJECT CODE : MC281
YEAR : FIRST
SEMESTER : 2nd Semester
CONTACT HOURS : 3P
CREDITS : 2

Prerequisite:
Knowledge of English in 10+2 standards

Course Objective:
The objectives of this course are as follows; to expose the students to different aspects of corporate life and workplace behavior; to introduce workplace behavioral norms, etiquettes and standards; to equip students to face interviews, presentations and other professional interactions

Course Outcome
After completion of this course student will be able to
MC281.1: Understand the communication skill in social and professional fields.
MC281.2: Apply good communication skills in technical fields.
MC281.3: Develop good communication skills and all-round personalities with a mature outlook to function effectively

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MC281.1	2			3		3	2	2	3	3		3
MC281.2	2	3	3	3		3	3	3	2	3		3
MC281.3	1	3	3	3		2	2	2	2	3		2

Course Contents:

MODULE I – COMMUNICATION TRAINING
- Organizational Communication and Structure.
- Vocabulary related to Corporate Operation.
- Modes of Communication (Telephone, Conference Call, Team Huddle, Public
- Relation etc.
- Communication with Clients, Customers, Suppliers etc.
- Verbal and Non-Verbal Communication, Proxemics and Para Language.
- Vocabulary Building (Synonym / Antonym / One word Substitution etc.)

MODULE II- COMMUNICATION TRAINING (ACCENT NEUTRALISATION)
- Mother Tongue Influence
- Vowel Sounds and Consonantal Sounds
- Pronunciation and Neutral Accent.
- Intonation.
- Rate of Speech, Pausing, Pitch Variation and Tone.

MODULE III – BUSINESS ETIQUETTE
- Presenting oneself in the Business Environment.
- Corporate Dressing and Mannerism.
- Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
- Multi Cultural Etiquette.

- Cultural Difference.
- E-mail Etiquette.

MODULE IV – JOB APPLICATION AND CV / VIDEO RESUME
- Format (Chronological, Skill Oriented, Functional etc.)
- Style and Appearance.
- Writing Tips and Video Content Presentation tips.
- Types of Cover Letter or Job Application Letter.

MODULE V - INTRODUCTION TO CORPORATE LIFE AND PROTOCOLS
Introduction of Companies (Domain Specific)
- Opportunities and Growth Plan.
- Performance and Corporate Behaviour.
- Service Level Agreement and Corporate Jargon.
- Networking and Adapting to Culture, Technology and Environment.

MODULE VI – GROUP DISCUSSION
- Introduction, Definition and Purpose.
- Types of Group Discussion.
- Strategies and Protocols of Group Discussion.
- Skills and Parameters of Evaluation.
- Practice Session and Video Viewing Task.

MODULE VII – LEADERSHIP SKILL
- Leadership Theories.
- Traits and Skills of the Leader.
- Roles, Duties and Responsibilities.
- Case Study of Leaders.
- Interpersonal relationship with Team.

MODULE VIII – TEAM WORK
- Concept of Team Culture.
- Stages of Team Development (Forming, Storming, Norming, Performing, Adjourning)
- Team Working Agreement (Participation, Decision Making, Problem Solving. Conflict Management, Flexibility, Negotiation Skill.
- Team Building (Assess, Plan, Execute and Evaluate)

MODULE IX – PUBLIC SPEAKING AND INTERVIEW BASICS
- Extempore.
- JAM.
- Interview Skill
- Interview over Telephone, Video Conference Interview etc.

MODULE X – BUSINESS TELEPHONE ETIQUETTE (2L)
- Five Phases of a Business Call.
- Pitch, inflection, Courtesy and Tone.
- Understanding, Rate of Speech, Enunciation.
- Hold Procedure.
- Cold and Hot Transfer protocols.
- Dealing with Different Types of Customers (Irate, Talkative, Turnaround etc.)

MODULE XI- READING SKILL
- Vocabulary from context, speed reading, skimming, inferring, comprehension test etc.

References:

1. IIT Mumbai, Preparatory Course in English syllabus
2. IIT Mumbai, Introduction to Linguistics syllabus
3. Sasikumar et al. A Course in Listening and Speaking. New Delhi: Foundation Books, 2005.
4. Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.

3RD SEMESTER

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**MATHEMATICS –III**
SUBJECT CODE	:	**M(IT)301**
YEAR	:	**SECOND**
SEMESTER	:	**3rd Semester**
CONTACT HOURS	:	**3L+1T**
CREDITS	:	**4**

Prerequisite:
An introductory course on Relation and Function, preliminary understanding of Permutation and Combination and knowledge of basic graph theory.

Course Objective:
The purpose of this course is to provide fundamental concepts of to Basics of Probability and its Distribution, Discrete Mathematics, Algebraic Structures, Linear Algebra and Advanced Graph Theory.

Course Outcome
After completion of this course student will be able to

M(IT)301.1: Recall the distinctive characteristics of Basic Probability and Probability Distribution, Sampling Theory, Estimation of Parameters, Testing of Hypothesis, Algebraic Structures, Linear Algebra, Advanced graph Theory.

M(IT)301.2: Understand the theoretical workings of Basic Probability and Probability Distribution, Sampling Theory, Estimation of Parameters, Testing of Hypothesis, Algebraic Structures, Linear Algebra, Advanced Graph Theory to evaluate the various measures and forms in related field.

M(IT)301.3: Demonstrate various real world scenarios using concepts of Basic Probability and Probability Distribution, Sampling Theory, Estimation of Parameters, Testing of Hypothesis, Algebraic Structures, Linear Algebra, Advanced Graph Theory.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M(IT)301.1	3	2										1
M(IT)301.2	3	2										1
M(IT)301.3	3	2	2									1

Course Contents:

MODULE I : [12L]
Basic Probability Theory: Classical and Axiomatic definition of Probability (elementary properties), conditional probability, Baye's theorem and related problems. Probability Distributions: One dimensional random variable. Probability distributions-discrete and continuous.Expectation.Binomial, Poisson, Uniform, Exponential, Normal distributions and related problems.t, χ 2 and F-distribution (Definition only). Transformation of random variables. Central Limit Theorem, Law of large numbers (statement only) and their applications. Tchebychev inequalities (statement only) and its application.

MODULE II : [10L]
Statistics Sampling theory: Random sampling. Statistic and its Sampling distribution. Standard error of statistics. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems. Estimation of parameters: Unbiased and consistent estimators. Point estimation. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson and Normal).Confidence

intervals and related problems. correlation (t-test). Testing of Hypothesis Simple and Composite hypothesis. Critical region. Level of significance. Type I and Type II errors. One sample and two sample tests for means and proportions .χ 2 - test for goodness of fit.

MODULE III: [6L]
Algebraic Structures Group, Subgroup, Cyclic group, Permutation group, Symmetric group (S3), Coset, Normal subgroup, Quotient group, Homomorphism & Isomorphism (Elementary properties only). Definition of Ring, Field, Integral Domain and simple related problems.

MODULE IV: [8L]
Linear Algebra: Vector spaces over any arbitrary field, linear combination, linear dependence and independence, basis and dimension, inner-product spaces, Linear transformations, matrix representation of linear transformations, quadratic forms.

MODULE V: [8L]
Advanced Graph Theory: Planar and Dual Graphs. Kuratowski's graphs. Homeomorphic graphs. Euler formula for connected planar graph and its generalization for graphs with connected components. Detection of planarity, Graph Coloring, Chromatic Numbers and its bounds, Independence and Clique Numbers, Perfect Graphs-Definition and examples, Chromatic polynomial and its determination, Applications of Graph Coloring. Matching: Definitions and Examples of Perfect Matching, Maximal and Maximum Matching, Hall's Marriage Theorem (Statement only) and related problems.

Text Books:

1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Lipschutz S: Theory and Problems of Probability (Schaum's Outline Series) - McGraw Hill Book. Co.
5. Spiegel M R: Theory and Problems of Probability and Statistics (Schaum's Outline Series) - McGraw Hill Book Co.
6. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur& Sons.
7. Deo N: Graph Theory with Applications to Engineering and Computer Science - Prentice Hall.

Reference Books:

1. Grewal B S: Higher Engineering Mathematics (thirtyfifthedn) - Khanna Pub.
2. Kreyzig E: Advanced Engineering Mathematics - John Wiley and Sons.
3. J.K. Sharma, Discrete Mathematics, Macmillan
4. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
5. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press. 11. Douglas B. West, Introduction to graph Theory, PHI
6. Lakshminarayan- Engineering Math 1.2.3
7. Spiegel M R., Schiller J.J. and Srinivasan R.A. : Probability and Statistics (Schaum's Outline Series), TMH.
8. Wilson: Introduction to graph theory, Pearson Education.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PHYSICS-II**
SUBJECT CODE	**:**	**PH(IT)301**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3^{rd} Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Pre requisites:
Knowledge of Physics up B.Tech 1^{st} year Physics-I course

Course Objective:
The Physics-II course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcome

After completion of this course students will be able to

PH(IT)301.1: Define, understand and explain
- electrostatics, magnetostatics and electromagnetic theory
- operator formalism in Quantum Mechanics
- categories of storage devices
- materials at the low-dimensions
- fundamental particles

PH(IT)301.2: Apply the knowledge of
- Vector space & Heisenberg representation in developing knowledge of quantum bit
- Quantum bit and its representation as a two level system to design quantum logic gates
- Schrödinger equation in problems of junction diode, tunnel diode
- Magnetism and semiconductors in data storage
- Electromagnetic theory in communication and networking
- Poisson's equations in various electronic systems
- Fermi levels in intrinsic and extrinsic semiconductors

PH(IT)301.3: Analyze
- role of superposition principle in generation of large number of Qubits.
- the principle of display devices
- Which type of magnetic materials to be used for data storage purpose
- Role of quantum confinement in inducing novel feature of a nano material
- change in electric and magnetic fields in various symmetrical bodies
- Quantum gates and quantum circuits

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
PH(IT)301.1	3	1										1
PH(IT)301.2	3	2										2
PH(IT)301.3	2	3										1

Course Contents:

MODULE I : [8L]
Electricity and Magnetism, Electrostatics, Gauss's law in integral form and conversion into differential form, Equation of continuity, Extend to Poisson's & Laplace's equation, Application to parallel plate, spherical and cylindrical capacitors (equivalent 1D problem). Magnetostatics: Lorentz force (concept in Hall effect-), force on a small current element placed in a magnetic field. Biot-Savart law- non existence of magnetic monopole, Ampere's circuital law, Magnetic vector and scalar potential. Electro-magnetism & Electromagnetic theory: Faraday's law, Concept of displacement current, Maxwell's field equations with physical significance, wave equation in free space, transverse nature of electromagnetic wave.

MODULE II: [12L]
Quantum Mechanics-II: Formulation of quantum mechanics and Basic postulates-superposition principle, orthogonality of wave function, expectation value; operator correspondence, Commutator. Measurements in Quantum Mechanics-Eigen value, Eigen function, Schrödinger's equation as energy eigen value equation. Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well; Discussion on degenerate levels), 1D finite barrier problem and concept of quantum tunnelling (solve only $E<V_0$). Quantum Computation and Communication: The idea of n-dimensional vector space, use of 'bra-ket' notation, matrix representation of bra & kets; basis, Hilbert space; Pauli matrices. Idea of qubit and examples of single qubit logic gates-Classical bits, qubit as a two level system; Bloch vector, Pauli gate, Hadamard gate, Phase shift gate, Quantum circuits related to Quantum gates.

MODULE III: [6L]
Statistical Mechanics, Basics of Statistical Mechanics: Concept of energy levels and energy states. Microstates, Macrostates and thermodynamic probability, MB, BE, FD, statistics (Qualitative discussions)- physical significance, conception of bosons, fermions, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, Concept of Fermi level.
Applications of Statistical Mechanics: Fermi level in metals, total energy at absolute zero and total number of particles. Fermi level for intrinsic and extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p type, n-type).

MODULE IV: [4L]
Storage and display devices, Different storage and display devices: Magnetic storage materials, Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Optical storage-CD, DVD, Blu-ray Disc. Operation and application of CRT, Liquid crystal display (LCD), LED, Plasma display, Thin film transistor display).

MODULE V: [3L]
Physics of Nanomaterials: Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Application of nanomaterials (CNT, grapheme, electronic, environment, medical)

Text Books

1. 1.Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2,
2. Principles of Engineering Physics Vol 1 and Vol 2; by Md. N. Khan and S. Panigrahi, Pub:
3. Cambridge Univ. press
4. Introduction to Quantum MechanicsS. N. Ghoshal (Calcutta Book House)

5. Introduction to solid state physics-Kittel (TMH)
6. Nanostructure and Nanomaterials, B.K. Parthasarathy

Reference Book s

1. Edward M Purcell Introduction to Electrodynamics Griffiths David J. The Feynman Lectures on Physics. 2 (2nd ed.).,
2. Feynman, Richard P Addison-Wesley. ISBN 978-0-8053- 9065-0
3. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
4. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
5. Quantum Computation and Quantum Information(10th Anniversary Edition)- Nielsen &
6. Chuang (Cambridge University Press)
7. Solid State Physics- Ali Omar (Pearson Eduction)
8. Solid state physics- S. O. Pillai
9. Solid State Physics-A. J. Dekker (Prentice-Hall India) 5. Materials Science-Raghavan
10. 11.Introduction to Nanotechnology, B.K. Parthasarathy
11. 12.Nanomaterials Handbook (Advanced Materials and Technologies)- YuryGogotsi (Editor)

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : NEMERICAL METHODS AND STATISTICS
SUBJECT CODE : M(IT)302
YEAR : SECOND
SEMESTER : 3rd Semester
CONTACT HOURS : 3L
CREDITS : 3

Pre requisites:
Mathematics

Course Objective:
The purpose of this course is to provide basic understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic and fundamental concepts of Statistics.

Course Outcome:
After completion of this course students will be able to

M(IT)302.1: Recall the distinctive characteristics of various numerical techniques and the associated error measures, different descriptive measures of Statistics, correlation and regression.
M(IT)302.2: Understand the theoretical workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems and demonstrate error.
M(IT)302.3: Develop mathematical model of various real world scenarios using concepts of mathematical approaches and solve the same by numerical techniques, judge if the results are reasonable, and then interpret and clearly communicate the results.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
M(IT)302.1	3	2										1
M(IT)302.2	3	2										1
M(IT)302.3	3	2	2									1

Course Contents:

MODULE I: [16L]
Numerical Method I: Approximation in numerical computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic. Interpolation: Calculus of Finite Differences, Newton forward/backward interpolation, Lagrange's interpolation, Divided difference and Newton's divided difference Interpolation. Numerical integration: Newton Cotes formula, Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. Numerical solution of a system of linear equations: Gauss elimination method, LU Factorization method, Gauss-Seidel iterative method. Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi, Newton-Raphson method.

MODULE II[7L]:

Numerical Method II: Numerical solution of ordinary differential equation: Taylor series method, Euler's method, Euler's modified method, Milne's Predictor- Corrector Method, Fourth order Runge-Kutta method. Numerical solution of partial differential equation: Finite Difference method, Crank–Nicolson method

MODULE III[10L]:

Statistics: Basic Statistics-measure of central tendency, dispersion, Probability, distribution-introduction to mass function, density function, distribution function (Binomial, Poisson, Normal), Correlation &Regression, Curve fitting and method of Least Square.

Text Books:

1. Shishir Gupta &S.Dey, Numerical Methods, TMH
2. C.Xavier: C Language and Numerical Methods.
3. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).
4. S S Sastry: Introduction & methods of numerical analysis, PHI
5. N. G. Das: Statistical Methods, TMH.
6. Pal and Das: Discrete Mathematics, U N Dhur and Sons.
7. D. S. Sancheti & V.K.Kapoor : Statistics Theory , Method & Application, Sultan chand & sons , New delhi

References Books:

1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. SoumenGuha& Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.
6. Numerical Analysis, Shastri, PHI
7. Numerical Analysis, S. Ali Mollah
8. Numerical Analysis, James B. Scarbarough
9. Numerical Methods for Mathematics ,Science&Engg., Mathews, PHI

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **ANALOG AND DIGITAL ELECTRONICS**
SUBJECT CODE : **EC(IT)303**
YEAR : **SECOND**
SEMESTER : **3rd Semester**
CONTACT HOURS : **3L**
CREDITS : **3**

Prerequisite:
Mathematics, Physics, Basic Electronics.

Course Objective:
The objective of the course is to prepare students to perform the analysis and design of various digital and analog electronic circuits.

Course Outcome
After completion of this course student will be able to

EC(IT)303.1: Understand basic analog and digital electronics, including semiconductor properties, operational amplifiers, combinational and sequential logic and analog-to-digital digital-to-analog conversion techniques

EC(IT)303.2: Identify different symbols, working principles of basic Digital electronics circuits for data processing application

EC(IT)303.3: Analyze the characteristics of basic digital circuits

EC(IT)303.4: Design analog amplifiers, combinational logic devices and sequential logic devices like counters and registers

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC(IT)303.1	2					2						1
EC(IT)303.2												
EC(IT)303.3		2		3								
EC(IT)303.4		2	3	2	1	1	2					

Course Contents

MODULE I : [10L]

Analog Electronics: Recapitulation of P-N diodes, BJT, FET , Feedback and OPAMP ;Power Amplifiers – Class A, B, AB and C - basic concepts, power, efficiency calculation; Phase Shift, Wein Bridge oscillators; Astable & Monostable Multivibrators, 555 Timer and Multivibrators ; Schimtt Trigger circuit.

MODULE II: [9L]

Introduction to Number Systems: Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, EBDIC, Gray codes and their conversions ; Signed binary number representation with 1's and 2's complement methods , Binary arithmetic; Boolean algebra ; Various logic gates; Representation in SOP and POS forms ; Minimization of logic expressions by algebraic method , K-MAP method and Quin Mc-Clusky Method.

MODULE III: [5L]

Combinational Circuits: Adder and Substractor; Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and Checker.

MODULE IV: [6L]

Sequential Circuits: Basic Flip-flop & Latch ; SR, JK, D, T and JK Master-slave Flip Flops Registers (SISO,SIPO,PIPO,PISO); Ring counter, Johnson counter ; Basic concept of Synchronous and Asynchronous counters ; Design of synchronous and asynchronous Mod N Counter.

MODULE V: [2L]

A/D and D/A conversion techniques: Basic concepts of R-2R , A/D and D/A; successive approximation ADC

MODULE VI: [2L]

Logic families: TTL, ECL, MOS and CMOS - basic concept

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications', D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**DATA STRUCTURE AND ALGORITHM**
SUBJECT CODE	:	**IT301**
YEAR	:	**SECOND**
SEMESTER	:	**3rd Semester**
CONTACT HOURS	:	**3L+1T**
CREDITS	:	**4**

Prerequisite:

Basic Mathematics, Programming language

Course Objective:

The objective of the course is to provide knowledge of various data structures and algorithms; to introduce difference techniques for analyzing the efficiency of computer algorithms and provide efficient methods for storage, retrieval and accessing data in a systematic manner and explore the world of searching, sorting, traversal and graph tree algorithm along with demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists and trees.

Course Outcome

After completion of this course student will be able to

IT301.1: Use different kinds of data structures which are suited to different kinds of applications, and some are highly specialized to specific tasks.

IT301.2: Manage large amounts of data efficiently, such as large databases and internet indexing services.

IT301.3: Use efficient data structures which are a key to designing efficient algorithms.

IT301.4: Use some formal design methods and programming languages which emphasize on data structures, rather than algorithms, as the key organizing factor in software design.

IT301.5: Store and retrieve data stored in both main memory and in secondary memory.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT301.1	3	2		1			1					
IT301.2	3	3	2	3								
IT301.3	3		3									
IT301.4		3		2								
IT301.5		3		2								

Course Contents:

MODULE –I : [8L]

Introduction : Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations. Array : Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials. Linked List : Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

MODULE –II: [7L]

[Stack and Queue : Stack and its implementations (using array, using linked list), applications. Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications. Recursion : Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.

MODULE –III : [15L]

Trees : Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree-operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only). Huffman tree.

Graphs : Graph definitions and Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications. Minimal spanning tree – Prim's algorithm

MODULE – IV: [10L]

Sorting Algorithms : Internal sorting and external sorting Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap), radix sort. Tree Sort technique .Searching : Sequential search, binary search, interpolation search. Hashing : Hashing functions, collision resolution techniques

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E. Mc graw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PHYSICS-II LAB**
SUBJECT CODE	**:**	**PH(IT)391**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rd Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
Knowledge of Physics upto B.Tech Physics-I lab

Course Objective:
The Physics-II Lab course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcomes:
At the end of the course students will be able to know to find out:

PH(IT)391.1: Examine the characteristics of analog electronic circuit devices such as BJTs and FETs, amplifiers

PH(IT)391.2: Make use of different basic logic gates and universal gates

PH(IT)391.3: Implement the combinational circuits in digital electronics using basic logic gates

PH(IT)391.4: Construct sequential circuits like registers and counters using flip-flops and basic gates

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH(IT)391.1	3	2										1
PH(IT)391.2	1	2		3								1
PH(IT)391.3	1	2							3			1
PH(IT)391.4	1	2								3		

Course Contents:

MODULE I : -Electricity Magnetism

1. Study of dipolar magnetic field behaviour.
2. Study of hysteresis curve of a ferromagnetic material using CRO.
3. Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.
4. Measurement of Curie temperature of the given sample.
5. Determination of dielectric constant of given sample (frequency dependent).
6. Determination of Hall co-efficient of a semiconductor and measurement of Magneto resistance of a given semiconductor

MODULE II: -Quantum Mechanics-II

7. Determination of Stefan's radiation constant.
8. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells & measurement of maximum workable power.
9. Measurement of specific charge of electron using CRT.
10. Determination of band gap of a semiconductor.

In addition to regular 7 experiments it is **recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:

1. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
2. Determination of thermal conductivity of a good conductor by Searle's mothod.
3. Study of I-V characteristics of a LED.
4. Study of I-V characteristics of a LDR
5. Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.

Text Books

1. 1.Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2,
2. Principles of Engineering Physics Vol 1 and Vol 2; by Md. N. Khan and S. Panigrahi, Pub:
3. Cambridge Univ. press
4. Introduction to Quantum MechanicsS. N. Ghoshal (Calcutta Book House)
5. Introduction to solid state physics-Kittel (TMH)
6. Nanostructure and Nanomaterials, B.K. Parthasarathy

Reference Book s

1. Edward M Purcell Introduction to Electrodynamics Griffiths David J. The Feynman Lectures on Physics. 2 (2nd ed.).,
2. Feynman, Richard P Addison-Wesley. ISBN 978-0-8053- 9065-0
3. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
4. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
5. Quantum Computation and Quantum Information(10th Anniversary Edition)- Nielsen &

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**NEMERICAL METHODS AND STATISTICS LAB**
SUBJECT CODE	**:**	**M(IT)392**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rd Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**3**

Pre requisites:
Concept of basic programming knowledge (C/C++/MATLAB)

Course Objective: The purpose of this course is to provide basic programming skills for solving numerous problems in numerical methods and statistics.

M(IT)392.1: Write efficient, well-documented code in order to derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

M(IT)392.2: Present numerical results in an informative way and analyze and evaluate the accuracy of common numerical methods.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
M(IT)392.1	2	3	3		1							1
M(IT)392.2	2	3	3		1							1

Course Contents:

1. Assignments on Newton forward /backward, Lagrange's interpolation.

2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.

3. Assignments on numerical solution of a system of linear equations using Gauss elimination, Gauss Jacobi and Gauss-Seidel iterations.

4. Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Newton-Raphson method.

5. Assignments on ordinary differential equation: Euler's method, Euler's modified method, Runge-Kutta methods.

6. Simple problems as assignment on Measures of Central Tendency- mean, median, mode, Measures of Dispersion- variance, standard deviation. Problems related to engineering field.

Text Books:

1. Shishir Gupta &S.Dey, Numerical Methods, TMH
2. C.Xavier: C Language and Numerical Methods.
3. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).

References Books:

1. S S Sastry: Introduction & methods of numerical analysis, PHI
2. N. G. Das: Statistical Methods, TMH.
3. Pal and Das: Discrete Mathematics, U N Dhur and Sons.
4. D. S. Sancheti & V.K.Kapoor : Statistics Theory , Method & Application, Sultan chand & sons , New delhi

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ANALOG & DIGITAL ELECTRONICS LAB**
SUBJECT CODE	**:**	**EC(IT)393**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rd Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
Basic Mathematics, Programming language

Course Objective:
The objective of the course is to illustrate the different electronic circuit and their application in practice.

Course Outcomes:
At the end of the course students will be able to know to find out:

EC(IT)393.1: Examine the characteristics of analog electronic circuit devices such as BJTs and FETs, amplifiers

EC(IT)393.2: Make use of different basic logic gates and universal gates

EC(IT)393.3: Implement the combinational circuits in digital electronics using basic logic gates

EC(IT)393.4: Construct sequential circuits like registers and counters using flip-flops and basic gates

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC(IT)393.1				2								
EC(IT)393.2	2			2								1
EC(IT)393.3		2	2									
EC(IT)393.4		3	2			1						

Course Content:

1. Design of an amplifier.
2. Design of a Phase-Shift Oscillator.
3. Design of a Schmitt Trigger using Opamp.
4. Design of a Multivibrator circuit using 555 timer.
5. Design of Half and Full adder and Half and Full Substractor
6. Construction of simple Decoder & Multiplexer circuits using logic gates
7. Realization of RS / JK / D flip flops using logic gates
8. Design of Shift Register using J-K / D Flip Flop.
9. Realization of Synchronous Up/Down counter.
10. Design of MOD- N Counter (Synchronous and Asynchronous).
11. Study of DAC and ADC.

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications', D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : DATA STRUCTURE AND ALGORITHM LAB
SUBJECT CODE : IT391
YEAR : SECOND
SEMESTER : 3rd Semester
CONTACT HOURS : 3P
CREDITS : 2

Perquisite:
Basic Mathematics, Programming language

Course Objective:
To develop the conceptual understanding for solving problems using data structures such as linear lists, stacks, queues, hashing, trees and graphs and writing programs for these solutions.

Course Outcome:
After completion of this course student will be able to

IT391.1: Understand the concept of dynamic memory management, data types, basic data structures, and complexity analysis.

IT391.2: Introduce the concept of data structures through ADT.

IT391.3: Choose the appropriate linear and non-linear data structure and algorithm design method for a specified application design.

IT391.4: Analyze the complexity of the problems.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT391.1	3	2	1									
IT391.2	2	3	1	3								
IT391.3	3	3	3	3	2				2			3
IT391.4	3	2	1	3	2							1

Course Content:

1. Experiments should include but not limited to Implementation of array operations:
2. Stack and Queues: adding, deleting, elements circular Queue: Adding& deleting elements
3. Merging Problem:
4. Evaluation of expressions operations on Multiple stacks & queues:
5. Implementation of linked list: inserting, deleting, inverting a linked list
6. Implementation of stacks and queues
7. Using linked lists: Polynomial addition, Polynomial multiplication

8. Sparse Matrices: Multiplication , addition
9. Recursive and Non Recursive traversal Trees
10. Threaded binary tree traversal. AVL tree implementation
11. Application of Trees. Application of sorting and searching algorithms
12. Hash tables implementation: searching, inserting and deleting, searching and sorting techniques.

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E. Mc graw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **TECHNICAL REPORT WRITING AND LANGUAGE PRACTICE**
SUBJECT CODE : **HU 381**
YEAR : **SECOND**
SEMESTER : **3rd Semester**
CONTACT HOURS : **3P**
CREDITS : **2**

Perquisite:
A basic knowledge of listening and speaking skills and the ability to infer meaning from audio-video/online lessons.

Course Objective:
Understand and make use of a wide taxonomy of listening skills & sub-skills for comprehending & interpreting data in English; speak in English, using appropriate vocabulary and pronunciation in contextualized situations; put into effective practice the pragmatics of Group Discussion; write a detailed technical report as per organizational needs; interact in professional presentations and interviews

Course Outcomes:
At the end of the course students will be able to know to find out:

HU381.1: Impart skill-based lessons in a manner conducive to developing communicative and socio-linguistic competence in the learners.

HU381.2: Building general awareness, through guided practice, of the taxonomy of listening and speaking skills and sub-skills.

HU381.3: Build knowledge of the skills required for professional and public speaking so as to inculcate discourse competence in the learners.

HU381.4: Reinforce grammar skills and practice writing skills through the production of common industry and workplace documents.

HU381.5 Synthesize and integrate material from primary and secondary sources with their own ideas in research papers.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU381.1				3		3	2	2	3	3		3
HU381.2		3	3	3		3	3	3	2	3		3
HU381.3		3	3	3		2	2	2	2	3		2
HU381.4		2	3	3		2	1	1	2	3		2
HU381.5	3	3	2	3		2	3	2	2	3		2

Course Contents:

Module 1: The Need for a Language Laboratory
(a)Introduction to the Language Lab
(b)Skill-building exercises in the lab

Module 2: Power Listening
(a)Taxonomy of Listening Skills & Sub-skills [Aural Skimming, Scanning, Listening for Details, Note taking, Evaluative Listening, Empathetic Listening, Paralinguistic and Kinesic Inferencing]
(b)Audio-based Lessons
(c) Repairing Listening ‘Gaps’ through Learner Feedback

Module 3: Speaking Skills
(a)The Need for Speaking: Content and Situation-based speaking
(b)Speaking Activities: [Just a Minute, Paired Role Play, Situational Speaking Exercises]
(c)The Pragmatics of Speaking—Pronunciation practice and learner feedback.

Module 4: Group Discussion
(a)Teaching GD Strategies
(b)In-house video viewing sessions
(c)Extended Practice and feedback

Module 5: Writing a Technical Report
(a)Organizational Needs for Reports and types
(b)Report Formats
(c)Report Writing Practice Sessions and Workshops

Module 6: SWOT Analysis
(a)SWOT Parameters
(b)Organizational SWOT
(c) Case Study

Module 7: Presentation
(a)Teaching Presentation as a Skill
(b)Speaking Strategies and Skills
(c)Media and Means of Presentation
(d)Extended Practice and Feedback

Module 8: Personal Interview
(a)Preparing for the Interview: Interview Basics, Dressing and Grooming, Q & A
(b)Mock Interview sessions and feedback

1. Reference Books:
2. Nira Konar: English Language Laboratory: A Comprehensive Manual PHI Learning, 2011
3. D. Sudharani: Advanced Manual for Communication Laboratories & Technical Report Writing Pearson Education (W.B. edition), 2011
4. Adrian Duff et. al. (ed.): Cambridge Skills for Fluency
    A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)
    B) Listening (Levels 1-4 Audio Cassettes/Handbooks)
5. Cambridge University Press 1998 Mark Hancock: English Pronunciation in Use
6. 4 Audio Cassettes/CD’S OUP 2004

4TH SEMESTER

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : ENVIRONMENTAL SCIENCE
SUBJECT CODE : HU401
YEAR : SECOND
SEMESTER : 4th Semester
CONTACT HOURS : 2L
CREDITS : 2

Prerequisite:

Knowledge of Basic Chemistry

Course Objective:

The objective of the course is to apply the knowledge of environmental science to design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations; to analyze and discuss the relevance of environmental science to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions; function in multi/inter-disciplinary teams with a spirit of tolerance, patience and understanding so necessary for team work; recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcome

After completion of this course student will be able to

HU401.1: Describe the structure and function of environment and different types of environmental pollution.

HU401.2: Identify all types of resources and learn the quality parameter to maintain proper balance.

HU401.3: Demonstrate environmental problems like global warming, acid rain, natural and manmade disasters.

HU401.4: Demonstrate the controlling method of environmental pollution and apply their knowledge for environment management.

HU401.5: Apply the method of synthesis of green chemistry and find green solution.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU401.1	3	2					2					
HU401.2	3	2										
HU401.3	2	3	2			2	2					
HU401.4	2	3	2			2	3					
HU401.5	2	3				2						

Course Contents:

MODULE I : [6L]

General: Natural Resources: Forest Resource, water resource, mineral resource, energy resources (renewable, non-renewable, potentially renewable). Population Growth: Exponential Growth, logistic growth, Maximum sustainable yield Disaster Management: Types of disasters (Natural & Man-made), Floods, Earthquake, Tsunamis, Cyclones, landslides (cause, effect & control). Ecology & Ecosystem: Elements of ecology, definition of ecosystem- components types and function, Food chain & Food web, Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, and Aquatic ecosystems. Environmental Management: Environmental impact assessment, Environmental laws and protection act of India, Different international environmental agreement.

MODULE II : [6L]

Air Pollution: Sources of Pollutants: point sources, nonpoint sources and manmade sources primary & secondary pollutant. Types of air pollutants: primary & secondary pollutant ; Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN, Smog (Photochemical smog and London smog). Effects on human health & climate: Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion. Air pollution and meteorology: Ambient Lapse Rate, Adiabatic Lapse Rate, Atmospheric stability & Temperature inversion. control of air pollution (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury)

MODULE III : [6L]

Water Pollution: Classification of water (Ground & surface water). Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, heavy metals, pesticides, volatile organic compounds. Surface water quality parameters: pH, DO, 5 day BOD test, BOD reaction rate constants, COD. Numerical related to BO Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only),ground water pollution (Arsenic & Fluoride; sources, effects, control) , Quality of Boiler fed water: DO, hardness, alkalinity, TDS and Chloride, Layout of waste water treatment plant (scheme only).

MODULE IV[2L]

Land Pollution : Types of Solid Waste: Municipal, industrial, commercial, agricultural, domestic, hazardous solid wastes (bio-medical), E-waste , Solid waste disposal method: Open dumping, Land filling, incineration, composting, recycling (Advantages and disadvantages).

MODULE V[2L]

Noise Pollution : Definition of noise, effect of noise pollution on human health, Average Noise level of some common noise sources, Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18 hr Index) . Noise pollution control.

Text Books

1. A Textbook of Environmental Studies, Shashi Chawla. Tata McGraw Hill Education Private Limited
2. Environmental Studies, Dr. J P Sharma, University Science Press

Reference Books

1. Environmental Engineering, J K Das Mohapatra, Vikas Publication

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPUTER ORGANIZATION AND ARCHITECTURE**
SUBJECT CODE	**:**	**IT401**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3L +1T**
CREDITS	**:**	**4**

Prerequisite:

Mathematics, Digital Electronics, Basic Programming

Course Objective:

The objective of the course is to study the basic organization and architecture of digital computers, understanding and utilization of digital computers and design and application of computer systems as foundation for more advanced computer-related studies.

Course Outcome

After completion of this course student will be able to

IT401.1: Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

IT401.2: Describe the structure and functioning of a digital computer, including its overall system architecture, operating system, and digital components.

IT401.3: Construct various design techniques of CPU, Memory, pipelining, ALU, interconnecting I/O devices and microprogramming in order to achieve multiprocessing.

IT401.4: Developed and Design quantitative performance evaluation of computer systems.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT401.1	1	2	3			1	1					
IT401.2	2	2	3									
IT401.3	2	3	3									
IT401.4	2	3	3									

Course Contents:

MODULE I: [4L]

Basic Computer Functions and Interconnection Structures, Discussion between computer architecture and organization, Role of Operating System, Quantitative techniques in computer design. Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes

MODULE II: [8L]

Memory classification, Memory Hierarchy and characteristics; Organization of RAM, Magnetic memory recording formats & methods, Disk & tape units with detailed working principles. Memory Inclusion, Coherence and locality properties; Associative memory organization ; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Paging, mapping and management techniques, memory replacement policies.

MODULE III :[10L]
The ALU – ALU organization , Integer representation , Input/output Organization : Introduction to Bus architecture , effect of bus widths , Programmed & Interrupt I/O , DMA. Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address. Multiplication of signed binary numbers-Booth's algorithm ; Divide algorithms Restoring & Non- Restoring ; Floating point - IEEE 754 standard; Floating point number arithmetic; Overflow detection , status flags. Flynn's classification –SISD, SIMD, MISD, MIMD architectures

MODULE IV: [10L]
Timing diagrams; T-States, Controlling arithmetic & logic instruction, control structures; Hardwired & Micro programmed, CISC & RISC characteristics. Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards, Exception handling, Pipeline optimization techniques; Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super pipelined and VLIW processor architectures. Array and vector processors.

MODULE V: [10L]
Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared- memory architecture. Cluster computers. Non Von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures.

Text Books:

1. Mano, M.M., "Computer System Architecture", PHI.
2. Kai Hwang"Advance Computer Architecture" McGraw Hill
3. Behrooz Parhami " Computer Architecture", Oxford University Press
4. Nicholas P Carter"Computer Architecture & Organization" McGraw Hill,

Reference Book:

1. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill
2. Hamacher, "Computer Organisation", McGraw Hill
3. N. Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers" OUP
4. P. Chaudhuri P, "Computer Organisation & Design", PHI,
5. P N Basu- "Computer Organization & Architecture" , Vikas Publication

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMMUNICATION ENGINEERING AND CODING THEORY**
SUBJECT CODE	**:**	**IT402**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Mathematics, Physics, Electronics

Course Objective:

The objective of the course is to comprehend basics of communication system and coding techniques, apply the basic concept of PCM systems and baseband transmission schemes, analyze and evaluate band pass signaling schemes, produce spectral characteristics of band pass signaling schemes and asses noise issues.

Course Outcome

After completion of this course student will be able to

IT402.1: Understand basics of communication system and coding schemes.

IT402.2: Apply the basic concept of PCM systems and baseband transmission schemes.

IT402.3: Analyze and evaluate band pass signaling schemes.

IT402.4: Create spectral characteristics of band pass signaling schemes and asses noise performance.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT402.1	1	2	3								2	
IT402.2	1	2	3									
IT402.3	1	2	3									
IT402.4	1	3				1						

Course Contents:

MODULE I : [4L]

Elements of communication system, introduction to signals and modulation. Basic concept of a signal (Amplitude, frequency, wavelength, bandwidth), introduction to baseband transmission - modulation. Elements of Communication systems, origin of noise and its effect on communication system. Concept and need for modulation - types of modulation, concept of time domain and spectral representation of a signal.

MODULE II: [5L]

Linear Modulation: Basic principles of Amplitude Modulation with Time domain representation of AM signal, modulation index calculation, transmission bandwidth, power & efficiency calculations. Basic concept of square law modulator and balanced modulator. Detection of AM by envelope detector, Synchronous detection for AM-SC. Basic principles of Sideband suppressed techniques and the need for it. Need for carrier suppression .Basic concept of SSB-SC, DSB-SC, VSB-SC. Generation of SSB: Filter method, Phase shift method. Names of SSB-SC, DSB-SC generator and detector

MODULE III: [4L]
Non linear Modulation & Demodulation: Frequency Modulation and Phase Modulation: Time domain representations, total power calculation for a single tone message. Generation of FM & PM: basic concept and difference of wide band frequency modulation and narrow band frequency modulation. basic concept on direct and indirect method of FM generation : introductory discussion on Armstrong method. Basic block diagram representation of generation of FM & PM: basic Concept of VCO & Reactance modulator only. Demodulation of FM and PM: Only Basic Concept of frequency discriminators Phase Locked Loop Comparison of various Analog modulation techniques, inter relation between PM and FM

MODULE I V: [10L]
Sampling and digital transmission: Sampling theorem, Sampling rate, sampling theorem, nyquist rate, Impulse sampling, Reconstruction from samples, Aliasing; Analog Pulse Modulation – basic discussion on PAM, PWM, PPM. Concept of Quantisation & Uniform Quantiser, Non-uniform Quantiser, Quantisation error, signal to quantisation noise ratio calculation, A-law & μ-law companding (after discussion on companding mention only the two types and their use) ,Encoding, Coding efficiency. Basic concept of Pulse Code Modulation, Block diagram of PCM, basic concept of DPCM, Delta modulation, basic concept of slope overload and Granular.
distortion, Adaptive delta modulation. Multiplexing - TDM, FDM, SDM. Line coding & properties, NRZ & RZ, AMI, Manchester coding. Brief discussion on: ISI, Raised cosine function, Nyquist criterion for distortion-less base-band binary transmission, Eye pattern

MODULE V: [5L]
Digital Carrier Modulation & Démodulation Techniques: Introduction to the different digital modulation techniques-ASK, FSK, PSK, BPSK, QPSK, MSK, Introduction to QAM,. Spread Spectrum Modulation – DSSS, FHSS - concept only.

MODULE VI: [6L]
Information Theory & Coding: Introduction to Information Theory, Entropy, Mutual information, Information rate, channel and bandwidth, Bit rate, Baud rate, Information capacity, Shanon’s limit, Shanon-Fano algorithm for encoding, Huffman coding for numerical, Shannon's Theorem - Source Coding Theorem, Information Capacity Theorem. Error control Strategies: (Basic Concept of Data communication, concept of FEC, ARQ and CRC).

Text Books:

1. An Introduction to Analog and Digital Communications, Simon Haykin; Published by Wiley India.
2. Principle of Communication Systems by Herbert Taub and D.L.Schilling
3. Modern Digital and Analog Communication Systems –
4. Data Communication and Networking by Behrouz A. Forouzan, Published by Tata McGraw-Hill

References:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
2. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
3. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
4. Understanding Signals and Systems by Jack Golten, Published by McGraw Hill.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**FORMAL LANGUAGE AND AUTOMATA THEORY**
SUBJECT CODE	**:**	**IT403**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4^{th} Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Elementary discrete mathematics including the notion of set, f unction, relation, product, partial order, equivalence relation, graph& tree. They should have a thorough understanding of the principle of mathematical induction and various proof techniques.

Course Objective:

The objective of the course is to present a formal connection between algorithmic problem solving and the theory of languages and automata and develop a mathematical view of students towards algorithmic design and in general computation itself.

Course Outcome

After completion of this course student will be able to

IT403.1: Analyze situations in related areas of theory in computer science

IT403.2: Model, compare and analyze different computational models using combinatorial methods

IT403.3: Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata

IT403.4: Construct algorithms for different problems and argue formally about correctness on different restricted machine models of computation

IT403.5 Identify limitations of some computational models and possible methods of proving them

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT403.1	3	3	3	2								
IT403.2		3	3	3								
IT403.3	3	3	3	2								
IT403.4		3	2	3								
IT403.5	2	3	3	3	2							

Course Contents:

MODULE I:[14L]

Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram (Relating of Automata concept to sequential circuit concept) Design of sequence detector, Introduction to finite state model Finite state machine: Definitions, capability & state equivalent, kth-equivalent concept, Finite memory definiteness, testing table & testing graph. Minimization of FSM-completely specified and incompletely specified(Merger graph, Merger table, Compatibility graph) Equivalence between two FSM's, Limitations of FSM Application of finite automata, Finite Automata with output- Moore & Melay machine.

MODULE II:[10L]

Deterministic finite automaton and non deterministic finite automaton. Transition diagrams and Language recognizers. Finite Automata: NFA with Î transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Î transitions. NFA to DFA conversion. DFA minimization. Myhill-Nerode theorem Regular Languages: Regular sets. Regular expressions, identity rules. Arden's theorem state and prove Constructing finite Automata for a given regular expressions, Regular string accepted by NFA/DFA. Pumping lemma of regular sets. Closure properties of regular sets (proofs not required). Grammar Formalism: Regular grammars-right linear and left linear grammars. Equivalence between regular linear grammar and FA.

MODULE III:[10L]

Context free grammar. Derivation trees, sentential forms. Right most and leftmost derivation of strings. Context Free Grammars, Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form and Greibach normal form. Pumping Lemma for Context Free Languages. Enumeration of properties of CFL. Closure property of CFL, Ogden's lemma & its applications. Push Down Automata: Push down automata, definition. Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, inter conversion. Introduction to DCFL and DPDA.

MODULE IV: [6L]

Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions, Church's hypothesis, counter machine, Types of Turing machines Universal Turing Machine, Halting problem.

Text Books:

1. "Theory of Computer Science-Automata Languages and Computation", Mishra and Chandrashekaran, 2nd edition, PHI
2. "Switching & Finite Automata", ZVI Kohavi, 2nd Edn., Tata McGraw Hill

Reference Books:

1. "An Introduction to Computing", Peter Linz, Narosa.
2. "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : OBJECT ORIENTED PROGRAMMING USING JAVA
SUBJECT CODE : IT404
YEAR : SECOND
SEMESTER : 4th Semester
CONTACT HOURS : 3L
CREDITS : 3

Prerequisite:

Basic Computer programming, Mathematics

Course Objective:

The objective of the course is to introduce with the object oriented programming paradigm using JAVA and enable students to write the program and develop projects using JAVA.

Course Outcome
After completion of this course student will be able to
IT404.1: Understand the key concepts of object oriented programming and have an ability to design object oriented programs and appreciate the techniques of good design
IT404.2: Understand advanced features of Java
IT404.3: Analyze complex programming problems and optimize the solutions
IT404.4: Apply an understanding of ethical principles to problems which commonly arise in the Information Technology Industry

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT404.1	3	3	2	1								
IT404.2		2	2	2	3							
IT404.3	3	3	3	3	2							
IT404.4	3	3	3	2	3	2			3		3	

Course Content:

Object Oriented Design [3L]
The Objective of the course is to understand basic of Object Oriented Programming, the features of Java and to enable students to write Java program and develop projects.
Object Oriented Concepts [3L]
Class, object, message passing, inheritance, encapsulation, polymorphism, Difference between OOP and other conventional programming – advantages and disadvantages.

Understanding Java Programming Language[2L]
History of Java Programming languages, Purpose of invention of Java. Structure of a basic Java Program, Component of Java Development Kit-API, JRE, Understanding the steps to run a complete Java Program.

Basic Components of Java Program [2L]
Java Tokens-Literals, identifier, keywords, operator, separator, Data types, variables, constant, Type casting-defining type casting, requirement of type casting, implicit and explicit type casting. Control structure. Access specifier.

Class and Object Proprieties [6L]
Defining class and object, Class Members-Local variable, instance variable, class variable, Primitive and Reference variable, Constructor, this keyword, finalize and garbage collection, Array-Declaring and defining array, accessing array elements, length properties, 2D array, anonymous array, array of Objects. Understanding method- method returning object, passing objects, method passing and returning arrays, use of method overloading. Static-Static block and non static block, static variable, static method. nested & inner classes.

Reusability Properties [6L]
Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages

String Handling [2L]
Basic string handling concepts- String (discuss charAt(), compareTo(),equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() ,trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(),ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods),concept of mutable and immutable string, command line arguments

Exception handling & Multithreading [5L]
Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads.

Basic IO Operation and File Handling [3L]
Understanding unformatted and formatted IO. Reading and writing files.

Swing Programming [4L]
Swing Origins, Components and containers, Difference between AWT and swing, small swing programs, swing apps, concept of delegation event model and listener.

Applet Programming (using swing) [4L]
Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets.

Text Books:
1. Schildt, H., The Complete Reference JAVA McGraw – Hill.

Reference Books:
1. Head First JAVA- Kathie Seira

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **COMPUTER ORGANIZATION & ARCHITECTURE LAB**
SUBJECT CODE : **IT491**
YEAR : **SECOND**
SEMESTER : **4th Semester**
CONTACT HOURS : **3P**
CREDITS : **2**

Prerequisite:
Mathematics, Digital Electronics, Basic Programming knowledge.

Course Objective:

The objective of the course is to articulate design issues in the development of processor or other components and Learn microprocessor architecture and simulation of assembly language programming using XLINX tools.

Course Outcome
After completion of this course student will be able to
IT492.1: Apply the knowledge of mathematics, science, and engineering in simulation.
IT492.2: Use Hardware Description Language (HDL) in order to implement skills in designing Architectural solutions and describing designs using VHDL
IT492.3: Construct and examines digital circuit design using XLINX tool.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT492.1	3	2	3	2								
IT492.2		2	3	2								
IT492.3		2	3	3								

Course Contents:

All laboratory assignments are based on Hardware Description Language (VHDL or Verilog) Simulation.

- HDL introduction
- Basic digital logic base programming with HDL
- 8-bit Addition, Multiplication, Division
- 8-bit Register design
- Memory unit design and perform memory operations.
- 8-bit simple ALU design
- 8-bit simple CPU design

Text Books:

1. Mano, M.M., “Computer System Architecture”, PHI.
2. Kai Hwang”Advance Computer Architecture” McGraw Hill

Reference Book:

1. Hayes J. P., “Computer Architecture & Organisation”, McGraw Hill
2. Hamacher, “Computer Organisation”, McGraw Hill

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**COMMUNICATION ENGINEERING & CODING THEORY LAB**
SUBJECT CODE	:	**IT492**
YEAR	:	**SECOND**
SEMESTER	:	**4th Semester**
CONTACT HOURS	:	**3P**
CREDITS	:	**2**

Prerequisite:
Mathematics, Physics, Electronics

Course Objective:
Understand the channel performance using Information theory and various error-control code properties, apply linear block codes for error detection and correction, apply convolution codes for performance analysis & cyclic codes for error detection and correction, create and evaluate BCH & RS codes for Channel performance improvement against burst errors.

Course Outcome
After completion of this course student will be able to

IT492.1: Understand amplitude modulation and its demodulation.

IT492.2: Apply Amplitude Modulated Signal and measurement of modulation index for the various conditions under-modulated, over modulated and critically modulated.

IT492.3: Evaluate and measure the frequency deviation and the modulation index of the wave.

IT492.4: Design and analyze PAM and its demodulation and PWM, PPM.

IT492.5: Create and asses Pulse code modulation, ASK FSK, BPSK demodulation.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT492.1	1	2	3								2	
IT492.2	1	2	3									
IT492.3	1	2	3									
IT492.4	1	3				1						
IT492.5	1	2	3									2

Course Content :

1. Generation of amplitude modulation (Design using transistor or balanced modulator chip (to view the wave shapes) and its demodulation.
2. Study of Amplitude Modulated Signal and measurement of modulation index for the various conditions under modulated, over modulated and critically modulated.
3. Study of Frequency Modulation (FM) and Demodulation Techniques. Measure the frequency deviation and the modulation index of the wave.
4. Generation of FM using VCO chip
5. Study on time division multiplexing and de-multiplexing

6. Generation of PAM and its demodulation
7. Generation of PWM AND PPM (using IC 555Timer)
8. Study of Pulse code modulation and demodulation
9. Study of Digital Modulation techniques: Generation of ASK and its demodulation
10. Study on Digital Modulation Techniques Generation of ASK and its demodulation
11. Study of Digital Modulation techniques: Generation of FSK and its demodulation
12. Study of Digital Modulation techniques: Generation and demodulation of BPSK

Text Books:

1. An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley India.
2. Principle of Communication Systems by Herbert Taub and D.L.Schilling

Reference Books:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)

2. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **OBJECT ORIENTED PROGRAMMING LAB**
SUBJECT CODE : **IT494**
YEAR : **SECOND**
SEMESTER : **4th Semester**
CONTACT HOURS : **3P**
CREDITS : **2**

Prerequisite:
Mathematics, Physics, Electronics

Course Objective:
The objective of the course is to enable students to use basic object oriented features in coding enable students to develop projects

Course Outcome
After completion of this course student will be able to
IT494.1: Apply object oriented programming concepts in designing programs
IT494.2: Analyze different dimensions of a problem and provide optimal solutions
IT494.3: Apply the advance features of JAVA in designing of projects

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT494.1	3	2	2		1	1						
IT494.2	2	3	2		3	1						
IT494.3	3	3	2		3	2						

Course Content:

MODULE I:
Writing simple java program, compiling and running.
Understanding the main() method.

MODULE II:
Using basic java token, control structures.

MODULE III:
Illustrating class objects, constructor, final, finalize
Understanding Arrays and hands on application using array
Understanding and writing methods
Static and non static concepts

MODULE IV:
Class Relationship
Using inheritance
Creating abstract classes, interfaces

MODULE V:
String Handling

MODULE VI:
Illustrating exception handling
Illustrating multi threading applications

MODULE VII:
Basic IO and File IO operation

MODULE VIII:
AWT and Swing applications

MODULE IX:
Applet programming

Text Books:
1. Schildt, H., The Complete Reference JAVA McGraw – Hill.

Reference Books:
1. Head First JAVA- Kathie Seira

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**TECHNICAL SKILL DEVELOPMENT (PYTHON PROGRAMMING)**
SUBJECT CODE	:	**MC481**
YEAR	:	**SECOND**
SEMESTER	:	**4^{th} Semester**
CONTACT HOURS	:	**3P**
CREDITS	:	**2**

Perquisite:
Basic Mathematics, Computer Programming.

Course Objective:
The objective of the course is to provide knowledge of Python and to design and execute the different applications using Phython.

Course Outcome
After completion of this course student will be able to

MC481.1: Understanding basic of Python Programming Language.

MC481.2: Analyze problems and design effective solutions of them.

MC481.3: Apply the best features of Python to program real life problems.

MC481.4: Implement optimal solution of any problem.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MC481.1	2											2
MC481.2		3	3	2								
MC481.3					3							
MC481.4		2	3		3	2			2			

Course Contents

Module 1: Introduction to Python
Installation of Python
Two modes of using Python Interpreter
Variables and Data Types
Operators and their Precedence

Module 2: Loops and Iterations
Iteration: while and for loops
Python Syntax, Colon & Indentation
Syntax of 'for loops'
Conditional Execution: if, elif and else
Modify loops: break and continue

Module 3: Strings & Lists
Python Strings
Slicing
Python Lists

Mutable and Immutable Types

Module 4: Functions and More on Strings & Lists
Functions
Optional and Named Arguments
More on Strings & Lists experiments
Split and Join
Manipulating and Copying Lists

Module 5: Modules and Packages
Python Modules and Packages
Different ways to import Packages
File Input/Output
The pickle module
Formatted Printing
Exception Handling

Module 6: Graphics, GUI and Object Oriented Programming
Turtle Graphics
Writing GUI Programs
Object Oriented Programming in Python
Inheritance, reusing code

Module 7: Files and Streams
File related modules in Python
File modes and permissions
Reading & Writing data from a file
Redirecting output streams to files
Working with directories, CSV files and Data Files

Module 8: Python and Databases
ODBC and Python
Working with Databases in MySQL
Working with Tables in MySQL
Working with SQLite Database

Text Books:
1. 'Python for Everybody – Exploring Data in Python 3', Charles Severance, Shroff Publishers & Distributors Pvt. Ltd.
2. 'Python Training Guide', Mercury Learning & Information USA, BPB Publications, 2015

Reference Books:
1. 'Python for Education', Ajith Kumar B. P., Inter University Accelerator Center, New Delhi, 2010
2. 'Python Cookbook: Recipes for Mastering Python 3', 3rd Edition - David Beazley & Brian K. Jones, O'Reilly Media, Inc., 2013

5TH SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DESIGN ANALYSIS OF ALGORITHM**
SUBJECT CODE	**:**	**IT501**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5^{th} Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:

Discrete Mathematics Data Structure and Basic Programming Knowledge

Course Objective:

The objective of the course is to study paradigms and approaches used to analyze and design algorithms and to appreciate the impact of algorithm design in practice, use different computational models, order notation and various complexity measures to analyze the complexity/performance of different algorithms.

Course Outcome

After completion of this course student will be able to

IT501.1 Analyze the asymptotic performance of algorithms.

IT501.2 Design the algorithms and execute rigorous correctness proofs for the algorithms.

IT501.3 Apply important algorithmic design paradigms and methods of analysis.

IT501.4 Synthesize efficient algorithms in common engineering design situations.

CO-PO Mapping

Course Content:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT501.1	1	3	2	2								
IT501.2	1	3	2	2								
IT501.3	2	3	3	3								
IT501.4	1	2	3	3								2

MODULE I [2L]

Introduction: Time and Space Complexity, Different Asymptotic notations and their mathematical significance

MODULE II [9L]:

Divide and Conquer: Basic method, use, Merge Sort, Quick Sort and their complexity, Heap Sort and its complexity. Dynamic Programming: Basic method, use, Matrix Chain multiplication, All pair shortest paths, single source shortest path, Strassen's matrix multiplication algorithm. Hashing: introduction, collision resolution, hash functions, analysis of hashing with chaining and with open addressing.

MODULE III[8L]:
Backtracking: Basic method, use, 8 queens' problem, Graph coloring problem. Greedy Method: Basic method, use, Knapsack problem, traveling sales man, Job sequencing with deadlines, Minimum cost spanning tree by Prim's and Kruskal's algorithm.

MODULE IV[3L]:

Branch and bound technique: integer programming, 0/1 knapsack problem

MODULE V[4L]:
Disjoint set manipulation: Set manipulation algorithm like UNION-FIND, union by rank. String matching problem: Different techniques – Naive algorithm, Knuth, Morris, Pratt (KMP) algorithm with their complexities.

MODULE VI[6L]:
Amortized Analysis: Aggregate, Accounting, and Potential Method. Network Flow: Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

MODULE VII [6L]:
Matrix multiplication Algorithm: Application of matrix multiplication to solution of simultaneous linear equations using LUP decomposition, Inversion of matrix and Boolean matrix multiplication.

MODULE VIII [5L]:
Notion of NP-completeness: P class, NP class, NP hard class, NP complete class – their interrelationship, Satisfiability problem, Cook's theorem (Statement only). Approximation Algorithms: Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes.

Textbooks:
1. A. Aho, J. Hopcroft and J. Ullman "The Design and Analysis of Algorithms"
2. E. Horowitz and Shani "Fundamentals of Computer Algorithms"

Reference books:
1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms"
2. D. E. Knuth "The Art of Computer Programming", Vol. 3

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**SOFTWARE ENGINEERING**
SUBJECT CODE	**:**	**IT502**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:

Mathematics, Data Structure and Basic Computations.

Course Objective:

In this course, students will gain a broad understanding of the discipline of software engineering and its application to the development of and management of software systems. Knowledge of basic software engineering methods and practices and their appropriate application.

Course Outcome

After completion of this course student will be able to

IT502.1 Ability to analysis and design of complex systems and meet ethical standards, legal Responsibilities.

IT502.2 Ability to apply software engineering principles, techniques and develop, maintain, Evaluate large-scale software systems.

IT502.3 To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis.

IT502.4 Ability to work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT502.1	3	2	1	1				1			1	1
IT502.2		3	1	2	2			1			1	1
IT502.3	2	1	3		1			1				1
IT502.4			2	3	3			1				1

Course Contents:

Introduction [3L]

Definition of Software Engineering, Software crisis, Evolution of technology- Hype curve, Exploratory style of Software development vs. Software Engineering, Human cognition mechanism, Software Engineering principle- abstraction and decomposition.

Software Development Life Cycle (SDLC) models [4L]

Water fall model, V-shape Model, Prototyping Model, Spiral Model, RAD Agile Model, Verification and Validation.

Software Project Management [7L]
Responsibility of a project manager, Project planning, Metrics for project size estimation, Project estimation techniques, COCOMO model, Halstead's Software Science, Scheduling-CPM, PERT, Gantt chart, Risk management, Software configuration management, Staffing and team leader project and planning

Requirement analysis and specification [4L]
SRS, Requirement gathering and specification, Functional requirement, Traceability, 4GL.

Software Design [8L]
Characteristics of a good software, Cohesion and coupling, Function oriented design- DFD, Structure chart. Design phase in life cycle, System Design Definitions, Concept and methodologies, data flow oriented Design, Program Design and the requirements. Object oriented design- class and relationship, UML diagram, Use Case Model, State chart diagram.

Coding and Testing [7L]
Coding Standard, software documentation, Testing- unit testing, black box testing-equivalence class partitioning, boundary value analysis, white box testing- McCabe's Cyclometric Complexity, Mutation Testing, Debugging, Program analysis tool, Integration Testing, Grey box testing, System testing- Smoke and performance testing.

Software Reliability and Quality Management [5L]
Reliability, Hazard, MTTF, Repair and Availability, Software quality, Software reliability and fault-tolerance, six-sigma.

Computer-aided software engineering [5L]
Computer-aided software engineering (CASE)-environment and benefit. Function point methods (FSM,ISO,OMG) & Metrics. Standards: Capability Maturity Model Integration, ISO 9001.

Text Books:
1. Rajib Mall: Software Engineering, PHI
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition.

Reference Books:
1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Software Engineering: Iyan Somarville, 7th Edition.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : OPERATING SYSTEM
SUBJECT CODE : IT503
YEAR : THIRD
SEMESTER : 5th Semester
CONTACT HOURS : 3L + 1T
CREDITS : 4

Pre requisites:
Computer organization and Architecture, Data Structures, Algorithms & Programming Concept

Course Objective:
The objective of the course is to present an introduction to operating systems, with an emphasis on concurrency and control of asynchronous processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization.

Course Outcome:
After completion of this course students will be able to
IT503.1: Analyze the structure and basic architectural components involved in OS.
IT503.2: Demonstrate competence in recognizing and using operating system features
IT503.3: Understand and analyze theory and implementation of different operating system aspect.
IT503.4: Apply knowledge of different operating system algorithms.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT503.1	2	3	3	3					2			
IT503.2	2	3	3	3								
IT503.3	1	3	3	3					2			
IT503.4	2	3	3	3					2	1		2

Course Contents:

Introduction: [3L]
Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, timesharing, real-time, distributed, parallel.

System Structure: [3L]

Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Processes: [3L]

Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.

Threads: [2L]

Overview, benefits of threads, user and kernel threads.

CPU Scheduling: [3L]
Scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

Synchronization: [4L]
Background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

Deadlock: [4L]
System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Memory Management: [4L]
Background, logical vs. physical address space, swapping, contiguous memory allocation, Pre-paging, paging, segmentation, segmentation with paging.

Virtual Memory :[5L]

Background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing, Virtualization(VMware).

File Systems:[6L]
File concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance. Cases studies, access methods and matrices, file security, user authentication; Case studies of UNIX-LINUX Operating System and Mobile OS

I/O Management:[4L]
I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management: [3L]
Disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

Text Books:

1. Milenkovie M., "Operating System : Concept & Design", McGraw Hill.
2. Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.
3. Dhamdhere: Operating System TMH

Reference Books:

1. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
2. Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PROGRAMMING PRACTICE WITH C++**
SUBJECT CODE	**:**	**IT504A**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5^{th} Semester**
CONTACT HOURS	**:**	**3L +1T**
CREDITS	**:**	**4**

Prerequisite:

Basic computer programming concepts

Course Objective:

The objective of the course is to introduce with the object oriented programming paradigm using C++ and make the students understand different concept of C++ and apply the features in application development.

Course Outcome

After completion of this course student will be able to

IT504A.1: understand the difference between object oriented programming and procedural oriented language and data types in C++.

IT504A.2: program using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc.

IT504A.3: simulate the problem in the subjects like Operating system, Computer networks and real world problems.

IT504A.4: familiarized with Computer Language environment.

IT504A.5: implement various concepts related to Computer Language.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT504A.1	3	2	2	2								
IT504A.2	3	3	2	2								
IT504A.3	3	3	2	2								
IT504A.4	3	2	2	2								
IT504A.5	3	2	2	2								

Course Contents:

Introduction to Object oriented design, Declaration, Expression and statements [6L]

Concepts of object oriented programming language, Language translator, Basics of OOPs, Structure of C++ program, Class and object, Abstraction and encapsulation, Polymorphism.

Array, Function, Pointer & Data abstraction through classes and user defined data types: [8L]

Array , Addresses, Pointer. Function: Declaration, Definition and call, Inline function, Main function argument, Reference variable, Function overloading, Default argument, Parameter passing, Recursion, Scope of variable, Return-by-value and Return-by-reference, Pointer to function. Class, Members, Constructor and destructor, Copy constructor. Dynamic memory management: Operators new and delete, Malloc and free, Static member, Scope of class names, Scope of variables. Friend Function : understanding friend function and its use

Class relationships: Operator Overloading , Polymorphism & Standard Library in C++ [12L]
Overloading unary and binary operator, Overloaded function calls, Subscripting, class member access, Non-member operator, New and delete, Cast operator. Introduction, Polymorphism, Coercion, Overloading, Parametric and inclusion polymorphism Inheritance: direct and indirect superclasses, Multiple inheritance, Virtual base class, Friend, Virtual function, Abstract class, Overriding and hiding, Dynamic binding of functions, Virtual destructor and operators. Standard library in C++: Standard library function, Input and output, Iostream class hierarchy, Class ios, Other stream classes

Template , Exception Handling & UML Diagram [8L]
Class template, Member function inclusion, Function template, Specialization, Inheritance, Namespace. Concept of exception handling, Catch block, Nested try-catch block, Condition expression in throw expression, Constructor & destructor, Runtime standard exception. Object oriented design and modeling :Software development, Qualities of software system, Software architecture, Process life cycle, phases, Modularity, OO methodology, Modeling, UML overview, Object oriented design patterns.

Introduction to C++11 Features [8L]
Lambda Expressions, Automatic Type Deduction and decl type, Uniform Initialization Syntax, Deleted and Defaulted Functions, nullptr, Delegating Constructors, Rvalue References, Threading Library

Text Books:

5. Schildt, H., The Complete Reference C++, McGraw – Hill.
6. Balaguruswamy, Object Oriented Programming C++ McGraw – Hill.

Reference Books:

9. C++ object oriented programming paradigm, Debasish Jana, PHI
10. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ARTIFICIAL INTELLIGENCE**
SUBJECT CODE	**:**	**IT504B**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5^{th} Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:

Basic concept of computer science and automation, Knowledge of programming languages, Basic mathematical concept like calculus, probability, metrics and statistics.

Course Objective:
Apply knowledge of computing and mathematics appropriate to the discipline. Analyze a problem, and identify and define the computing requirements appropriate to its solution. Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs. Understand current techniques, skills, and tools necessary for computing practice.

Course Outcome
After completion of this course student will be able to

IT504B.1: Understand different types of AI agents and Tools.

IT504B.2: Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction).

IT504B.3: Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving.

IT504B 4: Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.

IT504B.5: Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT504B.1					3							
IT504B.2		2	3	3								
IT504B.3	2		3	3								
IT504B 4	2	3	1	3								
IT504B.5	2	3	1	3		1	1					

Course Contents:

Introduction to Artificial Intelligence and Agent [4L]
Foundations and History of Artificial Intelligence, Turing Test, Intelligent Agents – Agents and environment. Concept of Rationality, Nature of environments and Structure of agents.

Searching and Problem Solving [12L]
Problem solving agents - Problem formulation with suitable examples, searching for solutions, 8 puzzle problem, tower of Hanoi problem, water jugs problem, 8-queen problem, Data driven and goal driven search, Uninformed search strategies – Breadth-first search, Uniform-cost search, depth-first search, Depth-limited search, Uninformed search strategies Iterative deepening depth-first search, Bidirectional search, avoiding repeated states,

Informed search strategies – Greedy best first search, A* search, Informed search strategies Memory-bounded heuristic search, Heuristic Functions, Constraint satisfaction problems, stochastic search methods .

Game Playing [3L]
Adversarial search, Mini-max, alpha-beta pruning.

Knowledge Representation and Reasoning [12L]
Building a Knowledge Base, Propositional logic, first order, script and frame, Logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning, Hierarchical Task network planning, Planning and acting in nondeterministic domains. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks, Inference using full joint distribution, Independence, Bayes' rule and its use, Semantics of Bayesian Networks, Exact Inference in Bayesian networks, Rule-based methods for uncertain reasoning, Dempster-Shafer-theory.

Learning [11L]
Learning from observation – Forms of learning, Inductive learning, Learning Decision trees, Knowledge in learning - Explanation based learning, Learning Decision Trees, Neural Networks (Network structures, Single layer feed-forward neural network, Multilayer feed-forward neural network), clustering concept, Reinforcement Learning – Introduction, Passive reinforcement Learning, Active Reinforcement Learning.

Text Books:

1. Artificial Intelligence: A Modern Approach, Russell & Norvig, Prentice Hall.
2. Artificial Intelligence, Elain Rich and Kevin Knight, TMH.

Reference Books:

1. Prolog Programming for Artificial Intelligence Paperback by Ivan Bratko
2. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**OPERATIONS RESEARCH**
SUBJECT CODE	:	**IT504C**
YEAR	:	**THIRD**
SEMESTER	:	**5th Semester**
CONTACT HOURS	:	**3L + 1T**
CREDITS	:	**4**

Pre requisites:
Basic Knowledge of Function, plotting of Equation and inequations, Formulation of Mathematical Problem.

Course Objective:
The objective of the course is to develop models and analyze the model using different techniques, decision making under uncertainty and risk.

Course Outcome:
After completion of this course students will be able to
IT504C.1: Design knowledge-base representation models.
IT504C.2: Analyze the performance of rule-based-systems.
IT504C.3: Develop rule-based expert systems and planning tools.
IT504C.4: Implement heuristic search algorithms for real life problem solving.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT504C.1	1		2									
IT504C.2		3		2								
IT504C.3			3		1							
IT504C.4		1				1	2	2				

Course Contents

Linear Programming Problem [11L]:
Basics of Linear Programming Problem (LPP) and its Applications. General Mathematical Formulation of LPP; Definitions: Convex set, Solution, Feasible Solution, Basic and Non-Basic Variables, Basic Feasible Solution, Degenerate and Non-Degenerate solution, Optimum/Optimal Solution; Solution of LPP by Graphical Analysis/Method, Simplex Method, Charnes' Big M-Method; Duality Theory.

Module II [6L]:
Transportation Problem, Assignment Problem.

Network Optimization Models [8L]:
CPM / PERT (Arrow network, Time estimates, earliest expected time, latest allowable occurrence time, latest allowable occurrence time and stack. Critical path, Probability of meeting scheduled date of completion of project. Calculation of CPM network. Various floats for activities.

Game Theory [6L]:
Introduction; Two person Zero Sum game, Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance.

Sequencing[4L]:
Two men two machines, Three Men Two Machines.

Queuing Theory[9L]:
Introduction and Basic Structure of Queuing Theory; Basic Definitions and Notations. Birth-and-Death Model (Poisson / Exponential distribution); Poisson Queue Models: (M/M/1):(∞/FIFO) and (M/M/1):(N/FIFO) and Problems. Introduction to STOCHASTIC PROCESSES, Markov Process with Discrete State Space: Poisson Process, Applications in Stochastic Models (Queuing System and Models).

Text Books:

1. Operations Research by Kanti Swaroop and P.K. Man Mohan, Sultan Chand and Sons
2. Linear Programming and Theory of Games by Ghosh and Chakraborty, Central Book Agency
3. Linear Programming and Theory of Games by P.M.Karak, ABS Publishing House
4. Operations Research, D.K.Jana & T.K.Roy, Chhaya Prakashani Pvt. Ltd.
5. Operations Research, Kalavati,VIKAS
6. Operations Research,Humdy A Taha,PHI / Pearson
7. Stochastic Processes by J. Medhi, New Age International Publishers. (For Stochastic Model of Queuing Theory. Page Ch1:49-51, Ch3:138-149, Ch10:388-395).

Reference Books:

1. Operations Research Theory and Applications by J.K.Sharma, Macmillan India Limited.
2. Operations Research, Vijayakumar, Scitech
3. Operations Research by S.D. Sharma, Kedar Nath Ram Nath Publishers.
4. Operations Research by A.P. Verma, S. K. Kataria & Sons.
5. Operations Research by P.K. Gupta & Hira, S.Chand
6. Operations Research by V.K. Kapoor

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **INDUSTRIAL & FINANCIAL MANAGEMENT**
SUBJECT CODE : **HU 505**
YEAR : **THIRD**
SEMESTER : **5th Semester**
CONTACT HOURS : **2L**
CREDITS : **2**

Prerequisite:

Mathematics, English.

Course Objective:

- ✓ Introduce students to financial management and its importance and its applications in business, their relationship with the business environment and the role and functions of chief financial officer.
- ✓ Introduce students to financial planning, and objectives, and its benefits, and the types of areas and stages of financial planning, and the factors that help the success of financial planning and the methods used in financial planning to assess the short-term financial needs.
- ✓ Introduce students to time value of money and its relationship to the objectives of financial management, rationale for using the time value of money, and simple and compound interest and how to calculate it, and also to understand the present value of the future payments.
- ✓ Introduce students to major financial statements of businesses as well as the definition of the purposes and tools of financial analysis and its importance in the financial control process. Introduce students to the basics of investing in securities through exposure to the following points: knowledge of financial markets, and their components, and functions of the financial market, and the parties worked in the financial markets, the stock traded in the money markets and capital markets, then find out the efficiency standards of the financial market, as well as valuations of Shares and bonds.
- ✓ Giving students how to apply full financial cycle and makes the necessary adjustments on service and commercial installations
- ✓ Giving student's of Application processors to finance small projects.

Course Outcome

After completion of this course student will be able to

HU505.1: Explain and describe various technology-based business models and the dynamics of value creation, value proposition, and value capture in industrial enterprises.

HU505.2: Select, interpret and use different costing techniques as a basis for decisions in various business situations.

HU505.3: Understand the basic principles of financial accounting and reporting.

HU505.4: Produce and interpret an industrial company's Annual Statement, at a basic level.

HU505.5: Describe the operations of an industrial enterprise from various perspectives, and analyze its basic strengths and weaknesses based on concepts from the field of Industrial Management.

HU505.6: Explain how the industrial company markets and price it's products considering GST

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU505.1		1	1	2		2						
HU505.2					3	1	2				1	
HU505.3	3					2					3	
HU505.4		2			1		1					
HU505.5		3		2								
HU505.6		2	2	3							2	

Course Content:

Introduction [12L]
Introduction to Accounting, Important Definitions, Basic concepts and conventions, Types of Accounts with Golden Rule of Accounting, Journal, Ledger and Trial Balance, Preparation of Trading Account, Profit & Loss A/C and Balance Sheet for business organizations.

Financial Management [13L]
Introduction to Financial Management, Introduction, Definition and concept, scope, objective, functions of Finance Manager. Ratio Analysis: Definition, Objectives, Advantages & Disadvantages.
Classification of Ratios: Liquidity ratios, Capital Structure ratios, Activity ratios & Profitability Ratios, Capital Budgeting: Nature of Investment Decision, Importance of Capital Budgeting, capital budgeting process, Investment criteria, payback period, Rate of return, cash flow, discounting cash flow NPV method and IRR method, Benefit cost ratio, ARR.

Cost Accounting [8L]
Introduction to cost accounting-Cost Centre Cost unit, Elements of costs, Statement of cost or cost sheet, Marginal cost & C-V-P analysis with BEC. Budget and Budgetary Control: Concepts of Budget, Budgeting and budgetary control, advantages, disadvantages, uses, Master Budget, Zero Based Budget, Cash budget, Flexible budget.

Working capital management [5L]
Introduction-working capital concept-financing working capital-importance of working capital-management of working capital-working capital cycle-management of different components of working capital-working capital forecast.

Introduction to GST [4L]
Introduction to GST-Basic concept and application.

Text Books:

4. Financial Management, Khan & Jain, S. Chand
5. Management Accounting, Khan & Jain, S. Chand
6. Modern Accountancy, Haniff & Mukherjee, TMH

Reference Books:

1. An Introduction to Accountancy, S.N.Maheswari, Vikas publication
2. Cost Accounting: Theory and Practices, B. Banerjee, PHI
3. Financial Management, IM Pandey, Vikas

STREAM	**: INFORMATION TECHNOLOGY**
SUBJECT NAME	**: DESIGN ANALYSIS OF ALGORITHM LAB**
SUBJECT CODE	**: IT591**
YEAR	**: THIRD**
SEMESTER	**: 5th Semester**
CONTACT HOURS	**: 3P**
CREDITS	**: 2**

Prerequisite:
Discrete Mathematics, Data Structure, Basic Programming Knowledge

Course Objective:
The objective of the course is to analyze and design algorithms, use different computational models, order notation and various complexity measures to analyze the complexity/performance of different algorithms.

Course Outcome
After completion of this course student will be able to
IT591.1: Analyze a problem and design the solution for the problem.
IT591.2: Optimize the solution with respect to time complexity & memory usage.
IT591.3: Apply different algorithmic approaches for solving the problems.
IT591.4: Analyze the efficiency of algorithms using time and space complexity theory.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT591.1	2	3	2		3							
IT591.2	2		2		3							
IT591.3	2	3	2		3							
IT591.4	2	3	2		3							2

Course Content:

1. Implement Merge Sort using Divide and Conquer approach
2. Implement Quick Sort using Divide and Conquer approach
3. Find the minimum number of scalar multiplication needed for chain of matrix using dynamic programming
4. Implement all pair of Shortest path for a graph (Floyd- Warshall Algorithm) using dynamic programming
5. Implement Travelling Salesman Problem using dynamic programming
6. Implement Single Source shortest Path for a graph using Bellman Ford Algorithm
7. Implement 15 Puzzle Problem using Branch and Bound technique.
8. Implement 8 Queen Problem using Backtracking.
9. Implement any one of the following problems using Backtracking:
    - Graph Coloring Problem
    - Hamiltonian Problem
10. Implement any one of the following problem using Greedy method:
    - Knapsack Problem
    - Job sequencing with deadlines
11. Implement KMP algorithm for string matching.
12. Implement Ford Fulkerson algorithm.

Text books:

1. Aho, J. Hopcroft and J. Ullman "The Design and Analysis of Algorithms"
2. D. E. Knuth "The Art of Computer Programming", Vol. 3
3. E. Horowitz and Shani "Fundamentals of Computer Algorithms"

Reference books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms"

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**SOFTWARE ENGINEERING LAB**
SUBJECT CODE	**:**	**IT592**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite: Familiar with MS Office Package and Basic Computations.

Course Objective:
Demonstrate the UML diagrams with ATM system descriptions, Demonstrate the working of software testing tools with c language, Understanding Project Planning Tools.

Course Outcome:

After completion of this course student will be able to

IT592.1: Ability to analysis and design of complex systems and meet ethical standards, legal responsibilities

IT592.2: Ability to apply software engineering principles, techniques and develop, maintain, evaluate large-scale software systems.

IT592.3: To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis.

IT592.4: Ability to work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
IT592.1	2											
IT592.2		3		1				1				
IT592.3	1	2	3									
IT592.4	1	2	1					1				2

Course Contents:

1. Identifying the Requirements from Problem Statements
2. Requirements, Characteristics of Requirements, Categorization of Requirements, Functional Requirements, Identifying Functional Requirements
3. Estimation of Project Metrics
4. Project Estimation Techniques -COCOMO, Basic COCOMO Model, Intermediate COCOMO Model, Complete COCOMO Model, Advantages of COCOMO, Drawbacks of COCOMO, Halstead's Complexity Metrics
5. Modeling UML Use Case Diagrams and Capturing Use Case Scenarios
6. Use case diagrams, Actor, Use Case, Subject, Graphical Representation, Association between Actors and Use Cases, Use Case Relationships, Include Relationship, Extend Relationship, Generalization Relationship, Identifying Actors, Identifying Use cases, Guidelines for drawing Use Case diagrams

7. Identifying Domain Classes from the Problem Statements
8. Introduction to selenium tool for software testing.
9. JUnit, Static analysis, Junit Framework
10. Prepare a SRS document in line with the IEEE recommended standards
11. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
12. Draw the sequence diagram for any two scenarios & Draw the collaboration diagram.
13. Draw the state chart diagram & component diagram.
14. Perform forward engineering in java.(Model to code conversion)
15. Perform reverse engineering in java.(Code to Model conversion)
16. Draw the deployment diagram.

Text Book

1. Rajib Mall: Software Engineering, PHI
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition.

Reference Book

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Software Engineering: Iyan Somarville, 7th Edition

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**OPERATING SYSTEM LAB**
SUBJECT CODE	**:**	**IT593**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Computer architecture, C,C++, Java

Course Objective:
The objective of the course is to have students understand and appreciate the principles in the design and implementation of operating systems software.

Course Outcome
After completion of this course student will be able to

IT593.1: Describe the important computer system resources and the role of operating system in their management policies and algorithms.

IT593.2: Understand the process management policies and scheduling of processes by CPU

IT593.3: Evaluate the requirement for process synchronization and coordination handled by operating system

IT593.4: Describe and analyze the memory management and its allocation policies

IT593.5 Identify use and evaluate the storage management policies with respect to different storage management technologies.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT593.1	2	3	3	3					2			
IT593.2	2	3	3	3								
IT593.3	1	3	3	3					2			
IT593.4	2	3	3	3					2	1		2
IT593.5	1	2	2	2					2	1		2

Course Contents:

1. **Managing Unix/Linux Operating System :**
Installation & Configuration of Operating Systems-Multi Booting, VMware installation, Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Super block, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users & user groups.

2. **Process:** starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.

3. **Signal**: signal handling, sending signals, signal interface, signal sets.

4.**Semaphore**: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).

5.**POSIX Threads**: programming with pthread functions (viz. pthread_create, pthread_join,pthread_exit,pthread_attr_init, pthread_cancel)

6.**Inter-process communication**: pipes(use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO),message passing & shared memory(IPC version V).

Text Books:

1. Russ Cox, Frans Kaashoek, Robert Morris , xv6: a simple, Unix-like teaching operating system",Revision8.
2. Sumitabha Das , UNIX Concepts and Applications, Tata McGraw-Hill.

Reference Books:

1. Tanenbaum A.S., “Operating System Design & Implementation”, Practice Hall NJ.2.
2. Stalling, William, “Operating Systems”, Maxwell McMillan International Editions.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**PROGRAMMING PRACTICE WITH C++ LAB**
SUBJECT CODE	:	**IT 594A**
YEAR	:	**THIRD**
SEMESTER	:	**5^{th} Semester**
CONTACT HOURS	:	**3P**
CREDITS	:	**2**

Prerequisite:
Basic Computer concepts

Course Objective:
The objective of the course is to introduce with the object oriented programming paradigm using C++ and make the students understand different concept of C++ and apply the features in application development.

Course Outcome
After completion of this course student will be able to

IT594A.1: understand the difference between object oriented programming and procedural oriented programming language.

IT594A.2: program using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc.

IT594A.3: construct appropriate diagrams and textual descriptions to communicate the static structure and dynamic behavior of an object oriented solution.

IT594A.4: simulate the problem in the subjects like Operating system, Computer networks and real world problems.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT594A.1	3	2	2		1	1						
IT594A.2	2	3	2		3	1						
IT594A.3	3	3	2		3	2						
IT594A.4	3				3		2					2
IT594A.5	3	2	2		1	1						

Course Contents:

Introduction [4P]
Introduction of UNIX/Linux Operating System which includes preliminary commands, start-up & shutdown methodology, file handling as well as introduction to editors like Vi editor, introduction to GNU C & C++ compiler, as well as introduction to GNU & GDB script.

Basic Programming Concepts [3P]
Introduction to C++, basic loop control, executing programs, writing functions, selection statements, review of functions and parameters, command line arguments, recursion

Stream and Structure [3P]
I/O streams, arrays and string manipulation, pointers, structures & unions Template , Exception

Object Oriented Concepts [3P]
Object-Oriented Programming in C++, fundamentals of classes, constructors-destructors. Dealing with member functions

Overloading [3P]
Operator overloading and Polymorphism (both static & dynamic).

Inheritance [3P]
Introduction to Inheritance, derived class handling, abstract class, virtual class, overriding, template class, name-space & exception handling.

Memory Management [3P]
Dynamic memory allocation, implementation of Linked Lists, using C++.

C++11 Features [3P]
Basic C++11 features

Text Books:

1. Schildt, H., The Complete Reference C++, McGraw – Hill.
2. Balaguruswamy, Object Oriented Programming C++ McGraw – Hill.

Reference Books:

1. C++ object oriented programming paradigm, Debasish Jana, PHI
2. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**ARTIFICIAL INTELLIGENCE LAB**
SUBJECT CODE	:	**IT594B**
YEAR	:	**THIRD**
SEMESTER	:	**5th Semester**
CONTACT HOURS	:	**3P**
CREDITS	:	**2**

Perquisite:
Knowledge of programming languages.

Course Objective:
Provide understanding of the theoretical underpinnings of artificial intelligence; Introduce the basic problems that are solved in the field of artificial intelligence; Give the basic algorithms for simulating intelligence on computer machines; Offer schemes for knowledge representation and reasoning; Demonstrate the mechanisms of rule-based planning; Show the principles for inductive machine learning; This course includes the philosophical, psychological, and biological issues related to artificial intelligence.

Course Outcome:

After completion of this course student will be able to

IT594B.1: Understand the fundamentals of knowledge representation, inference and theorem proving using AI tools.
IT594B.2: Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
IT594B.3: Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.
IT594B.4: Apply various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction,)

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT594B.1	2											1
IT594B.2		3										1
IT594B.3	1		3									1
IT594B.4		3		2								1

Course Contents:

A. Write the following programs using PROLOG

1. Study of PROLOG facts and rules.

2. Write a program to compute factorial of a number.

3. Write a program to compute GCD of two numbers.

4. Write a program to represent facts and rules.

5. Write a program to represent a family tree.

6. Write a program to diagnosis intelligently.

7. Write a program to check whether a given line segment is vertical or horizontal?

8. Write a program for list processing.

B. Write the following programs using PROLOG

1. Write a program to solve 8 queens problem

2. Solve any problem using depth first search.

3. Solve any problem using best first search.

4. Solve 8-puzzle problem using best first search

5. Solve Robot (traversal) problem using means End Analysis

6. Solve traveling salesman problem.

C. Write some programs on recent trend in AI(It may be beyond the curriculums)

Jupyter Notebook(iPython) :Medical diagnosis.

Text Book

1. Artificial Intelligence: A Modern Approach,. Russell & Norvig, Prentice Hall.

2. Artificial Intelligence, Elain Rich and Kevin Knight, TMH.

Reference Book

1. Prolog Programming for Artificial Intelligence Paperback by Ivan Bratko

2. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : OPERATIONS RESEARCH LAB
SUBJECT CODE : IT594C
YEAR : THIRD
SEMESTER : 5th Semester
CONTACT HOURS : 3P
CREDITS : 2

Perquisite:
Knowledge of programming languages.

Course Objective:
Understand the meaning, purpose, different stages, tools of Operations Research; Explain the Applications of Operations Research; Describe the Limitations of Operation Research

Course Outcome:

After completion of this course student will be able to

IT594C.1: Understand knowledge of different Optimization Techniques.
IT594C.2: Analyze for better Optimization Techniques
IT594C.3: Implement Dijkstra's or Floyd's Algorithm, Maximal Flow Problem, PERT/CPM using TORA

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT594C.1	1	2										1
IT594C.2		3	2	3								
IT594C.3		3	3		3	1			1			

Course Content:
Software based lab using C /C++ or GNU C++ (G++ / GCC ++) or Code Blocks

1. Familiarization with O.R package: TORA
2. Assignment on Linear Programming Problem: Graphical Method Using O.R. Package TORA
3. Assignment on Transportation problem.
4. Assignment on Assignment problem
5. Assignment on Duality
6. Assignment on Simplex method (Including Charnes' Big-M Method)
7. Assignment on Game Theory
8. Assignment on PERT/CPM
9. Assignment on Queuing Problem

Text Books:

1. Operations Research by Kanti Swaroop and P.K. Man Mohan, Sultan Chand and Sons
2. Linear Programming and Theory of Games by Ghosh and Chakraborty, Central Book Agency
3. Linear Programming and Theory of Games by P.M.Karak, ABS Publishing House

Reference Books:

1. Operations Research Theory and Applications by J.K.Sharma, Macmillan India Limited.
2. Operations Research, Vijayakumar, Scitech
3. Operations Research by S.D. Sharma, Kedar Nath Ram Nath Publishers.

6TH SEMESTER

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **DATA BASE MANAGEMENT SYSTEM**
SUBJECT CODE : **IT 601**
YEAR : **THIRD**
SEMESTER : **6th Semester**
CONTACT HOURS : **3L + 1T**
CREDITS : **4**

Prerequisite:

Mathematics, Data Structure, Operating System.

Course Objective:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcome
After completion of this course student will be able to

IT601.1: Define Database Management System, explain fundamental elements of a database management system, compare the basic concepts of relational data model, entity-relationship model.
IT601.2: Design entity-relationship diagrams to represent simple database application scenarios, translate entity-relationship diagrams into relational tables, populate a relational database and formulate SQL queries on the data
IT601.3: Criticize a database design and improve the design by normalization
IT601.4: Choose efficient query optimization techniques, select suitable transaction management, concurrency control mechanism and Recovery management techniques.
IT601.5: Explain File organization and use appropriate index structure.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT 601.1	2	3	3	3					2			
IT 601.2	2	3	3	3								
IT 601.3	1	3	3	3					2			
IT 601.4	2	3	3	3					2	1		2
IT 601.5	1	3	3	3								

Course Contents:

Introduction [2L]
Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Entity-Relationship Model [3L]
Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Relational Model [4L]
Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

SQL and Integrity Constraints [8L]
Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Sub queries, Database security application development using SQL, Stored procedures and triggers.

Relational Database Design [8L]
Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF

Internals of RDBMS [6L]
Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.

File Organization & Index Structures [4L]
File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

Advanced Transaction Processing [5L]
Transaction-processing Monitors, Transactional workflows, E-Commerce, Main-memory databases, Real-time transaction systems, Long-duration transactions, Transaction management in multidatabases.

Text Books:
1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, “Fundamentals of Database Systems”, Benjamin Cummings Publishing. Company.

Reference Books:
1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill.
2. Peter Rob and Carlos Coronel, Database Systesm- Design, Implementation and Management (7/e), Cengage Learning.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**WEB TECHNOLOGY**
SUBJECT CODE	**:**	**IT602**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Computer Networking, Database Management System, JAVA Programming Language
Course Objective:
Describing the web application architecture and protocols, illustrating different technologies those are used to develop web applications, describing different frameworks those used to develop web applications

Course Outcome: At the end of the course students will be able to

IT602.1: Understand and evaluate web application architecture, technologies and frameworks.

IT602.2: Apply the knowledge of web technology in developing web applications

IT602.3: Evaluate different solutions in field of web application development.

IT602.4: Implement small to large scale project to provide live solution in web application development fields

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT602.1	3		3								2	
IT602.2		3		2		2						
IT602.3					3		2					
IT602.4					3			3	2			2

Course Content:
Introduction to World Wide Web [1L]
Web Architecture, Web Applications, Web servers, Web Browsers and Agents, Internet standards, DNS, SMTP etc.

Classification of Web Protocols [1L]
Pull and Push mechanism: Pros and Cons. HTTP, HTTPS, XMPP

Mark-up [1L]
HTML 4.x: Elements, Attributes, Tags, Forms, Input, Frames, Tables.

Cascading Style Sheets [1L]
Advantages, Rules, CSS, inline and external, using template Layouts,

Java Script and Node JS:[4L]
Basic java Script concepts, Use of Java Script, Variable, Object, function, Event Handling. Evaluation of Java Scrip. Create, Publish, Extend & Manage, Node.js HTTPs : Create Server and Get Data, Node.js Express, Node JS Mongo DB. Node.js Promise , Node.js Generators & Compare with Callbacks, Node js Streams : File stream, Pipes, Node.js Testing with Jasmine

Non-Browser Web Agents [2L]
Limitation of Applets**:** Security Policy, Signing an Applet,

Server-side Programming [7L]
Servlets: HTTP Tunneling, Programmatically issuing HTTP GET, POST etc. and retrieval of content Concept of Dynamic Web pages, Web server versus Application server, Role of threading in a Server, Servlet-2.x API conforming to Web 2.0: Role of web.xml as deployment descriptor, request and response, Basic request handling, parameter retrieval, multiple parameter retrieval, inter-Servlet collaboration: Dispatching the request, Concept of state of web: Sessions , tracking session, Using Cookies and jsession Id, Parameter passing to and from session, Servlet Filters and common uses of Filters and Cookies. Migration to Servlet 3.x plus and omission of web.xml and concept of Web Socket.

Persistence: JDBC 3.x framework [5L]
Need and different approaches of persistence of data, Connecting to databases using jdbc:odbc bridge and Type-4 drivers, Executing basic CRUD using JDBC: Statement, Prepared Statement, Result Set. Execution of batch SQL, Stored Procedures using Callable Statement, Transaction Failure management: Save Point and roll back concepts, Prevention of SQL injection, Concept of connection URL in details: Connecting to a remote database host (server). Concept of roles of Drivers: Java reflection in Action.

Java Server Pages [6L]
Benefits of JSP over Servlets, JSP scriptlets, page directives, declarations, action tags: <jsp:useBeabn/>, <jsp:include/> <jsp:forward/> , introduction to MVC and Spring MVC

XML Technologies [2L]
XML, Namespace, DTD, W3C XML Schema

Ajax [2L]
Introduction to Asynchronous pattern and Using XML to communicate over XML Http Request object. Handling 5 states and finding response state. Migration of Ajax to AJAJ

Web Service [3L]
Introduction to web service architecture. Simple object access protocol, Web service description language, RESTful web service.

Text Book:
1. Professional Java Server Programming Allamaraju, Apress

Reference Book:
1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent
Learning Solutions INC.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **COMPUTER NETWORKING**
SUBJECT CODE : **IT 603**
YEAR : **THIRD**
SEMESTER : **6th Semester**
CONTACT HOURS : **3L + 1T**
CREDITS : **4**

Prerequisite:
Basic Digital Communication, Computer Architecture and Operating System.

Course Objective:
Understanding the basic concept of different network models, explaining the network architecture, Analyzing and evaluating different network protocols.

Course Outcome
After completion of this course student will be able to

IT603.1: Understand the network model and architecture

IT603.2: Analyze different networking functions and features for indentifying optimal solutions

IT603.3: Apply different networking concepts for implementing network solution

IT603.4: Evaluate and implement routing algorithms for implanting solution for the real life problems

IT603.5: Implement model of fault tolerant computer networks.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT603.1	3	2	2	2								
IT603.2	2	3	3	2								
IT603.3	2	3	2	2								2
IT603.4	2	3	2	2								2
IT603.5	3	3	3	3								2

Course Content:

Overview of Data Communication and Networking: [4L]
Introduction; Data communications: components, data representation (ASCII,ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI and TCP/IP.

Physical Level: **[6L]**
Overview of data (analog & digital), signal(analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network.

Data link Layer: **[9L]**
Types of errors, framing, error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, GoBack- N ARQ, Selective repeat ARQ, HDLC; Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet,

Network layer: [8L]
Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : IP addressing, subnetting; Routing : techniques, Routing Protocols, ARP, IP, ICMP, IPV6.

Transport layer: **[7L]**
Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

Application Layer [6L]
DNS, SMTP, SNMP, FTP, HTTPS, Firewalls, IP Filtering

Text Books:
1. B. A. Forouzan – "Data Communications and Networking (5^{th} Ed.) " – TMH
2. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

Reference Books:
1. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
2. Black, Data & Computer Communication, PHI
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ERP**
SUBJECT CODE	**:**	**IT 604A**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Basic knowledge on management, managerial tasks, enterprise and networking.

Course Objective:
To acquire an overview to ERP and the knowledge on related technologies.
Skill to ERP Manufacturing Perspective and ERP modules.
To understand the ERP implementation lifecycle.
To examine ERP tools and understand the benefits of ERP

Course Outcome
After completion of this course student will be able to
IT604A.1: Understand the basic concepts and benefits of ERP

IT604A.2: Identify different technologies and IT support used in ERP.

IT604A.3: Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules.
IT604A.4: Understand and implement the ERP life cycle.

IT604A.5 Apply different tools used in ERP.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT 604A.1	3	2	2				1				2	
IT 604A.2	3	2	1	2							1	
IT 604A.3	2		2		2	2						
IT 604A.4		2	1		2							
IT604A.5		2	2		3							

Course Contents:

Overview of ERP [10L]:
The evolution of ERP systems: Evolution through Payroll system, Inventory Control system, Materials Requirement Planning, Manufacturing Resource Planning, advantages and disadvantages. Definition and Concept of ERP, Business reasons for rise and popularity of ERP system and Benefits.
Business processes supported by ERP systems: Various business functions in an Organization – Purchasing, Materials Management, Manufacturing, Sales & Distribution, Plant Maintenance, Quality Management, Finance & Accounting including Costing, Human Resources etc.
ERP market place: SAP, Oracle, PeopleSoft, JD Edwards, Baan, Microsoft's suit of products etc. Business modules in these ERP packages – a brief comparative description of business function modules and sub-modules. Overview of key end-to-end business processes supported in two major ERP systems – Order to Cash, Procure to Pay, Plan to Produce and Dispatch.

Information Technology and ERP systems [10L]:

The evolution of Information Technology (IT): Evolution of computer generations – Operating systems, File systems to Database Management systems, Communication Networks. Enabling of ERP systems by IT evolution.

The evolution of ERP systems architecture: Client-Server based architecture, Multi-Tier architecture – Presentation layer, Application layer, and Database layer. Brief discussion on Extended ERP systems - Web-enabled ERP architecture, Service- Oriented Architecture and Cloud Computing. Open Source ERP.

Related technology concepts: ERP and Supply Chain Management, and Customer Relationship Management, ERP and Business Intelligence, ERP and Data warehousing, ERP and E-business

Implementation of ERP system [10L]:

ERP implementation approach: Single vendor versus Best-of Breed ERP implementation, Big Bang versus Phased implementation, Using ERP of Application Service Provider.

ERP implementation life cycle: Planning different aspects, Understanding requirements and Process preparation – Gap analysis and Business Process Engineering, User Acceptance criteria, Design, Configuration, Customization, Extensions, Data migration, End-user training, User Acceptance, Going live, Roll-out. Differences between ERP implementation life cycle and Custom Software development phases. Drawbacks of ERP system.

Organizing implementation: Interaction with Vendors, Consultants, and Users. Contracts with Vendors, Consultants, and Employees. Project Management and Monitoring. ERP Project Organization– Formation of Steering Committee and different User Groups. Top Management Commitment and Steering Committee meetings. Change Management, Risks and Challenges in ERP implementation.

Post-implementation Support, Review, Maintenance and Security of ERP systems: A typical Support Cycle. Post-implementation Review of ERP systems – measures of review, and approaches for review System maintenance and ERP system maintenance. Software upgrade Security and Access control of ERP systems.

Emerging Trends and Future of ERP systems [10L]:

Emerging Technologies and ERP: Service-oriented Architecture: Enterprise SOA layers – Business processes, Business services, Components and Integration services, Advantages and Drawbacks of SOA, Difference between multi-layered Client-server architecture and SOA, basic awareness of NetWeaver from SAP, Websphere from Oracle and .Net from Microsoft. Enterprise Application Integration: Basic understanding of the concept, Types of EAI – User Interface, Method, Application Interface, Data. Radio Frequency Identification and ERP: awareness of RFID technology, Benefits of RFID integrated with ERPs. M-Commerce: basic concept and applications, difference with E-Commerce, benefits of integration with ERPs. Future of ERP: Technology transformation to SOA, more E-Commerce features, Growing mobile applications, Economical and Easy models of ERP deployment etc.

Text books

1. Electronic commerce (second edition) –Pete Loshin & Paul A. Murphy, Jaico Publishers2.E-commerce (second edition) – Bajaj & Nag , Tata McGraw Hill
2. Enterprise Resource Planning –Alexis Leon, Tata McGraw Hill

References:

1. Enterprise Resource Planning, 2nd Edition by Alexis Leon, Tata McGraw Hill Education, 2008
2. Guide to Planning ERP Application, Annetta Clewwto and Dane Franklin, McGraw Hill, 1997
3. The SAP R/3 Handbook, Jose Antonio, McGraw Hill

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**INFORMATION AND CODING THEORY**
SUBJECT CODE	**:**	**IT 604B**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6^{th} Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Mathematics, Basic Electronics

Course Objective:
This course provides a basic understanding of the fundamental theories and laws of information theory and coding theory and the construction of both source codes and error-detection-correction codes

Course Outcome
After completion of this course student will be able to

IT604B.1: Understand the concepts of information, mutual information, entropy and various source coding techniques for a reliable digital communication.
IT604B.2: Analyze the need for source coding and error control techniques in a communication system.
IT604B.3: Apply linear algebra, concept of Galois field, conjugate roots, minimal polynomial in channel coding techniques for error control.
IT604B.4: Generate different error control codes like linear block codes, cyclic codes, BCH codes, and perform error detection and correction.
IT604B.5: Design the circuit for different error control coding techniques.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT604B.1	3	3	3	1								
IT604B.2	3	3	3	2								
IT604B.3	3	3	3	2								
IT604B.4	3	3	3	2								
IT604B.5	3	3	3	2								2

Course Contents:

Introduction to Information theory [3L]:
Uncertainty and information Basic definition of information, zero memory source, entropy, channel model and channel matrix, mutual information, information measures for continuous random variables, source coding theorem, Shannon - Fano coding, Huffman codes, Kraft Inequality

Channel Capacity and Coding [7L]:
Channel coding, Information rate, channel capacity, information capacity theorem, The Shannon limit.

Linear and Block Codes For Error Correction [7L]:
Introduction to Linear and Block Codes, properties, Matrix description of linear block codes, parity check matrix, decoding of a linear block code, Standard array and syndrome detection, Error correction and detection capability of linear block code, Hamming codes, Block Diagram to generate a linear block code and its decoder

Cyclic Codes [7L]:
Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Decoding cyclic codes, Encoding and Decoding circuit, Golay codes.

BCH Codes [8L]:
Set, group, fields, Galois field Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes. Introduction to Reed Solomon Codes.

Convolutional Codes [8L] :
Encoding, state diagram, Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes: Viterbi decoding, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.

Text Books:
1. Information theory, coding and cryptography - Ranjan Bose; TMH.
2. Introduction to Error Control Codes - Salvatore Gravano, Oxford

Reference Books:
1. Information and Coding - N Abramson; McGraw Hill.
2. Introduction to Information Theory - M Mansurpur; McGraw Hill.
3. Information Theory - R B Ash; Prentice Hall.
4. Error Control Coding - Shu Lin and D J Costello Jr; Prentice Hall.
5. Todd K Moon,- Error Correction Coding: Mathematical Methods and Algorithms, John Wiley

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **MICROPROCESSOR & MICROCONTROLLER**
SUBJECT CODE : **IT 604C**
YEAR : **THIRD**
SEMESTER : **6th Semester**
CONTACT HOURS : **3L + 1T**
CREDITS : **4**

Prerequisites:
Digital Electronics, Computer Programming, Computer Organisation and Architecture

Course Objective:
To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

Course Outcome:
After completion of this course student will be able to

IT604C.1: Able to correlate the architecture, instructions, timing diagrams, addressing modes, memory interfacing, interrupts, data communication of 8085

IT604C.2: Recognize 8051 micro controller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts

IT604C.3: Recognize 8051 micro controller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts

IT604C.4: Apply instructions for assembly language programs of 8085, 8086 and 8051

IT604C.5: Design peripheral interfacing model using IC 8255, 8253, 8251 with IC 8085, 8086 and 8051.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT604C.1	3		2	2		2						
IT604C.2		3		2		3						
IT604C.3		3										
IT604C.4	3	3	2									
IT64C1.5				2		3						3

Course Contents:

Module -1: [10L]
Introduction to Microcomputer based system. History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages.
Architecture of 8085 Microprocessor, Pin description of 8085.
Address/data bus Demultiplexing , Status Signals and the control signals.
Instruction set of 8085 microprocessor, Addressing modes
Timing diagram of the instructions (a few examples).

Module -2: [10L]
Assembly language programming with examples, counter and Time Delays, Stack and Subroutine Interrupts of 8085 processor (software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O, Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer,

Module 3: [10L]
The 8086 microprocessor- Architecture, Addressing modes, interrupts

Introduction to 8051 Microcontroller –Architecture, Pin Details
Addressing modes, Instruction set, Examples of Simple Assembly Language.

Module -4: [10L]
Memory interfacing with 8085, 8086
Support IC chips- 8255, 8251, 8237/8257, 8259
Interfacing of 8255 PPI with 8085 and Microcontroller 8051.
Brief introduction to PIC microcontroller (16F877)

Text Book:

1. Microprocessor architecture, programming and application with 8085 – R. Gaonkar, Penram International
2. Fundamentals of microprocessor and microcontroller- B.Ram
3. An Introduction to Microprocessor and Applications –Krishna Kant, Macmillan

Reference Book:

1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan, Oxford university press
2. 8086 Microprocessor –K Ayala, Cengage learning
3. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH
4. The 8051 microcontrollers – Uma Rao and Andhe Pallavi, Pearson
5. The 8051 Microcontroller and Embedded System- Mazidi
6. The 8051 microcontroller - K. Ayala, Thomson

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : DIGITAL IMAGE PROCESSING
SUBJECT CODE : IT604D
YEAR : THIRD
SEMESTER : 6th Semester
CONTACT HOURS : 3L + 1T
CREDITS : 4

Prerequisite:
Mathematics, Computer Programming

Course Objective:

The aim of this course is to introduce to the students the basics of digital image processing. The students will gain overview about the available techniques and possibilities of this field. They will learn basic image transformation, segmentation algorithms and problems of object measurements.

Course Outcome: After completion of this course students will be able to

IT604D.1: Understand the fundamental concepts of a digital image processing system.
IT604D.2: Analyze images in the spatial as well as frequency domain using various transforms.
IT604D.3: Categorize and implement various compression techniques.
IT604D.4: Implement and evaluate the techniques for improving the image quality.
IT604D.5: Analyze and implement image segmentation and representation techniques

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT604D.1	2											1
IT604D.2	2	3	3	2	2							
IT604D.3			2	2					1			
IT604D.4		3	3	3	3		1		1			
IT604D.5	2	3	2	2	3		1		1			1

Course Contents:

Introduction to Digital Image Processing: [3L]
Elements of digital image processing systems, Elements of visual perception Brightness, contrast, hue, saturation, mach band effect, Image sampling and quantization.

Image Enhancement: [8L]
Spatial Basic grey level transformation, Histogram equalization, Histogram specification techniques, Noise Distributions, Image subtraction and Image averaging, Smoothing, sharpening filters, Frequency Domain methods: Introduction to Fourier Transform and DFT, Discrete Cosine Transform (DCT) and its properties, Smoothing in Frequency- Domain, Sharpening in Frequency- Domain, Homomorphic filtering.

Image Restoration: [7L]
Model of Image Degradation/restoration process, Noise models, Unconstrained restoration, Lagrange multiplier, Least mean square filtering, Constrained least mean square filtering, Wiener filtering.

Color Image Processing: [3L]
Different color Models, Color Transformations, Smoothing & Sharpening Color Image, Color Segmentation, Noise.

Image Compression: [6L]
Need for data compression, Different types of compression, Variable length coding-Huffman Coding, Run Length Encoding, Arithmetic coding, Lossy Compression: Vector Quantization, Transform coding, Basics of Image compression standards: JPEG.

Image Segmentation: [6L]
Thresholding, Region Based segmentation, Region growing, Region splitting and Merging, Edge detection, Canny edge detector.

Image registration: [3L]
Geometric transformations: translation, rotation, scaling, homomorphic coordinate system; ground control points, affine transformation.

Representation & Description: [4L]
Representation of segmented image, Boundary & Regional Descriptors, Use of Principal components for description.

Text Books:

1. Digital Image Processing by Woods, Gonzalves, Pearson
2. Digital Image Processing & Analysis by Chanda & Majumder,PHI

Reference Books:
1. Digital Image Processing by Jahne by Springer India
2. Image Processing, Analysis & Machine Vision by Sonka, VIKAS
3. Fundamentals of Digital Image Processing by Jain, PHI

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : DIGITAL SIGNAL PROCESSING
SUBJECT CODE : ECE(IT)605A
YEAR : THIRD
SEMESTER : 6th Semester
CONTACT HOURS : 3L
CREDITS : 3

Prerequisite:

Students should have thorough understanding of various signals and systems in time and frequency domain. Good understanding on arithmetic of complex numbers and elementary calculus. The candidates are expected to have a basic understanding of discrete mathematical structures.

Course Objective:

To study the z-transform, convolution and applications of z -transform.
To introduce students with transforms for analysis of discrete time signals and systems.
To study Discrete Fourier and Fast Fourier Transforms.
To use and understand implementation of digital filters and filter design techniques.

Course Outcome
After completion of this course student will be able to
ECE(IT)605A.1: Able to understand the classification and operations of discrete signals.
ECE(IT)605A.2: Able to interpret discrete time systems.
ECE(IT)605A.3: Able to analyze discrete time signal in frequency domain and their region of convergence using Z Transforms.
ECE(IT)605A.4: Able to define discrete systems in the Frequency domain using Fourier analysis tools like DFT, FFT.
ECE(IT)605A.5: Able to design FIR and IIR digital filters.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ECE(IT)605A.1	3	3	2	2								
ECE(IT)605A.2	3	3	2	2								
ECE(IT)605A.3	3	3	3	3	2	2	1	3		2		
ECE(IT)605A.4	3	3	3	3	3	3	1	3		3		
ECE(IT)605A.5	3	3	3	3	3	3	1	3		3	2	3

Course Contents:

Discrete-time Signals [7L]:
Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, Concept of basic signals as unit impulse, unit step, unit ramp, real & complex exponentials and sinusoid. Arithmetic operations on sequences as Time shifting, Time reverse and Time scaling. Classification of signals as deterministic & random, periodic & aperiodic, energy & power, even & odd, causal & non causal.

LTI Systems [5L]:
Classification of systems as causal & non causal, time variant & invariant, linear & non linear, stable & unstable. Representation of arbitrary sequence, idea of impulse response and the formulation of convolution sum. properties of convolution, parallel and cascade connection of LTI system.

Z-Transform [7L]:

Physical interpretation of Fourier transform and Laplace transform, mapping from s-plane to z-plane, interpretation of ROC, properties of ROC for finite and infinite duration causal, anti causal & non causal sequence, properties of Z-transform such as linearity, time shifting, time reversal, time scaling, differentiation & convolution, initial and final value theorem, inverse Z-transform by residue & partial-fraction expansion method., analysis of difference equation in z-domain.

Discrete Fourier Transform [5L]:

Idea of DTFT and its relation with DFT, idea of IDFT, Twiddle factors and their properties, computation of DFT/IDFT by matrix method, multiplication of DFTs and the idea of circular convolution, computation of circular convolution by graphical and matrix method, filtering of long data sequences using Overlap-Save and Overlap-Add method.

Fast Fourier Transform [4L]:

Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs using Butterflies diagram, bit reversal, examples for DIT & DIF FFT.

Filter Design [7L]:

Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, design of linear phase FIR filters, condition of linear phase, idea of windowing technique using rectangular, Hamming, & Blackman windows, Realization of digital filter using Direct form-I, Direct Form-II, cascade and parallel.

TEXT BOOKS:

1. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
2. Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.
3. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).

REFERENCE BOOKS:

1. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**COMPILER DESIGN**
SUBJECT CODE	:	**IT 605B**
YEAR	:	**THIRD**
SEMESTER	:	**6^{th} Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:
Mathematics, Computer Programming, Automata,

Course Objective:

To provide knowledge of parsing, lexical and syntax analysis.
To analyze various parsing techniques, code optimization.
Students will get an opportunity to learn about the compilers they practically use in labs.
To know how the parse trees are generated, errors are handled.
To know how to code is optimized; all of these concepts will be understood.

Course Outcome
After completion of this course student will be able to

IT605B.1: To understand the knowledge of parsing, lexical and syntax analysis.

IT605B.2: To analyze various parsing techniques, code optimization.

IT605B.3: To apply the knowledge about the compilers they practically use.

IT605B.4: To learn how the parse trees are generated, errors are handled and code is optimized.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT605B.1	3	2	1	3	3				2		1	2
IT605B.2	3	1	2	2					1			1
IT605B.3	3	1	2		2				1			2
IT605B.4	3	2	1	1	1				2			1

Course Content:

Introduction to Compilers [3L]:
Compilers and translators need of translators, structure of compiler: Phases of compilation and overview, Compiler construction tools.

Lexical Analysis (scanner) [5L]:
Role of lexical analyzer, design of lexical analyzer, regular expressions, Specification and recognition of tokens, input buffering, A language specifying lexical analyzer. Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing number of states of DFA, Implementation of lexical analyzer, scanner generator (lex,flex).

Syntax Analysis (Parser) [9L]:
Role of parsers, definition of parsing, Shift- reduce parsing, operator precedence parsing, predictive parsing. Context-free language and grammar, push-down automata, LL(1) grammar and top-down parsing, operator grammar, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator, Canonical LR parser.

Semantic Analysis [4L]:
Attribute grammar, syntax directed definition, evaluation and flow of attribute in a syntax tree.

Symbol Table [6L]:
Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

Intermediate Code Generation [5L]:
Translation of different language features, different types of intermediate forms. Syntax directed definition, construction of syntax trees, syntax directed translation scheme, implementation of syntax directed translation, three address code, quadruples and triples.

Code optimization and target code generation [3L]:
Code improvement local optimization, global optimization, loop optimization, peep-hole optimization.

Text Books:

1. Compilers Principle, Techniques & Tools - Alfread V. AHO, Ravi Sethi & J.D. Ullman; Addison Wesley.
2. Compiler Design by O.G. Kakde, Laxmi Publ.

Reference Books:

1. Theory and practice of compiler writing, Tremblay & Sorenson, Mc. Graw Hill.
2. System software by Dhamdae, MGH.
3. Keith D. Cooper and Linda Torczon, Engineering a Compiler, Elsevier.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**GREEN COMPUTING**
SUBJECT CODE	:	**IT 605C**
YEAR	:	**THIRD**
SEMESTER	:	**6th Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:
Computer Networks, Communication System

Course Objective:
To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment, skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user, and to understand how to minimize equipment disposal requirements.

Course Outcome
After completion of this course student will be able to
IT605C.1: Understand and analyze Green IT.
IT605C.2: Compare and invent new methodology for green assets like Data Centers.
IT605C.3: Gain knowledge about Grid framework.
IT605C.4: Understand the Protocols, Standards, and Audits of Green Compliance.
IT605C.5: Apply the concept of the Environmentally Responsible Business Strategies.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT 605C.1		2		3		2						2
IT 605C.2	3	2			3			1				
IT 605C.3	2		3				2					2
IT 605C.4	1		2		2			3				
IT 605C.5	3	2		1		2						3

Course Contents:

FUNDAMENTALS [7L]:
Green IT Fundamentals: Business, IT, and the Environment; Green computing: carbon foot print, scoop on power; Green IT Strategies: Drivers, Dimensions, and Goals; Environmentally Responsible Business: Policies, Practices, and Metrics.

GREEN ASSETS AND MODELING [7L]:
Green Assets: Buildings, Data Centers, Networks, and Devices; Green Business Process Management: Modeling, Optimization, and Collaboration; Green Enterprise Architecture Environmental Intelligence; Green Supply Chains; Green Information Systems: Design and Development Models.

GRID FRAMEWORK [7L]:
Virtualizing of IT systems; Role of electric utilities, Telecommuting, teleconferencing and teleporting; Materials recycling best ways for Green PC; Green Data center; Green Grid framework.

GREEN COMPLIANCE [7L]:
Socio-cultural aspects of Green IT; Green Enterprise Transformation Roadmap; Green Compliance: Protocols, Standards, and Audits; Emergent Carbon Issues: Technologies and Future.

CASE STUDIES [7L]:
The Environmentally Responsible Business Strategies (ERBS); Case Study Scenarios for Trial Runs; Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TEXT BOOKS:

1. Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.

REFERENCES:

1. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.
2. John Lamb, "The Greening of IT", Pearson Education, 2009.
3. Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008.
4. Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press,2012.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**SOFT COMPUTING**
SUBJECT CODE	**:**	**IT605D**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Mathematics, Automata, Artificial Intelligence

Course Objective:

To give students knowledge of soft computing theories fundamentals, that is of fundamentals of non-traditional technologies and approaches to solving hard real-world problems, namely of fundamentals of artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms.

Course Outcome
After completion of this course student will be able to

IT605D.1: Understand importance of soft computing.

IT605D.2: Understand different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.

IT605D.3: Implement algorithms based on soft computing.

IT605D.4: Apply soft computing techniques to solve engineering or real life problems.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT605D.1	3	3	2	2	2				2		1	1
IT605D.2	3	3	2	2					1			1
IT605D.3	3	3	2	2	1				1			2
IT605D.4	3	3	3	2	2				2			2

Course Contents:

Introduction [4L]: Soft Computing. Difference between Hard and Soft computing, Requirement of Soft Computing, Major Areas of Soft Computing, Applications of Soft Computing.

Fuzzy Systems [10L]:
Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Min-max Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

Genetic Algorithm [8L]:
History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

Neural Networks[8L]:
Neural Network, Learning rules and various activation functions, Single layer Perceptrons , Back Propagation networks, Architecture of Back propagation(BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction

to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

Multi-objective Optimization Problem Solving [6L]:
Concept of multi-objective optimization problems (MOOPs) and issues of solving them. Multi-Objective Evolutionary Algorithm (MOEA). Non-Pareto approaches to solve MOOPs Pareto-based approaches to solve MOOPs. Some applications with MOEAs.

Hybrid Systems [6L]:
Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

Text Books:

1. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
3. Genetic Algorithms: Search and Optimization, E. Goldberg

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee PHI.
2. Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **PROJECT MANAGEMENT**
SUBJECT CODE : **IT605E**
YEAR : **THIRD**
SEMESTER : **6th Semester**
CONTACT HOURS : **3L**
CREDITS : **3**

Prerequisite:
Mathematics, Software Engineering

Course Objective:

The aim of this course is to introduce the fundamental principles of Software Project management. The students will also have a good knowledge of responsibilities of project manager and how to handle these. They will be familiar with the different methods and techniques used for project management.

Course Outcome
After completion of this course student will be able to
IT605E.1 Describe the basic concepts of software project management and project planning
IT605E.2 Apply project management techniques to real-world project
IT605E.3 Apply different techniques in monitoring and control of project and people.
IT605E.4 Work in team to understand and evaluate project management standard, tools, managing contracts and software quality.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT605E.1											3	
IT605E.2	1	2	3	2		1	2				2	
IT605E.3		2			2			1		2	2	
IT605E.4					2				3		2	3

Course Contents:

INTRODUCTION [5L]:
Project Definition, Contract Management, Activities Covered by Software Project Management, Overview of Project Planning, Step wise Project Planning.

PROJECT EVALUATION [5L]:
Strategic Assessment, Technical Assessment, Cost Benefit Analysis, Cash Flow Forecasting, Cost Benefit Evaluation Techniques, Risk Evaluation.

ACTIVITY PLANNING [6L]:
Objectives, Project Schedule, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass, Backward Pass, Activity Float, Shortening Project Duration, Activity on Arrow Networks, Risk Management, Nature of Risk, Types of Risk, Managing Risk, Hazard Identification, Hazard Analysis, Risk Planning and Control.

MONITORING AND CONTROL [8L]:

Creating Framework, Collecting the Data, Visualizing Progress, Cost Monitoring, Earned Value Prioritizing Monitoring, Getting Project Back To Target, Change Control, Managing Contracts, Introduction, Types of Contract, Stages In Contract Placement, Typical Terms of A Contract, Contract Management, Acceptance.

MANAGING PEOPLE AND ORGANIZING TEAMS [8L]
Introduction, Understanding Behavior, Organizational Behaviour: A Background, Selecting The Right Person For The Job, Instruction In The Best Methods, Motivation, The Oldham, Hackman Job Characteristics Model, Working In Groups, Becoming A Team, Decision Making, Leadership, Organizational Structures – Stress –Health And Safety – Case Studies.

PROJECT QUALITY MANAGEMENT [3L]
Concept of Project Quality, TQM in Projects, Project Audit.

TEXT BOOKS
1. Bob Hughes, Mike Cotterell, "Software Project Management", Third Edition, TataMcGraw Hill, 2004

REFERENCES:
1. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Royce, "Software Project Management", Pearson Education, 1999.
3. Jalote, "Software Project Management in Practice", Pearson Education, 2002.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **HUMAN RESOURCE MANAGEMENT**
SUBJECT CODE : **IT605F**
YEAR : **THIRD**
SEMESTER : **6th Semester**
CONTACT HOURS : **3L**
CREDITS : **3**

Prerequisite:
Project Management

Course Objective:
Learn fundamental HRM frameworks and analyze the overall role of HRM in business. It improves their ability to think about how HRM should be used as a tool to execute strategies and achieve a competitive advantage.

Course Outcome
After completion of this course student will be able to

IT605F.1	Explain the importance of human resources and their effective management in organizations
IT605F.2	Describe the meanings of terminology and tools used in managing employees Effectively and Record governmental regulations affecting employees and Employers
IT605F.3	Demonstrate a basic understanding of different tools used in forecasting, planning and maintenance of human resource needs
IT605F.4	Analyze the key issues related to administering the human elements such as Motivation, compensation, appraisal, career planning, diversity, ethics, and training

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT605F.1		1	1					2	3	2	3	
IT605F.2					2	2	1	1		2	3	
IT605F.3					2			1		2	3	2
IT605F.4							2			2	3	2

Course Content:

Introduction [3L]:
Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization.

Procurement and Placement [3L]:
Need for Human Resource Planning, Process of Human Resource Planning, Methods of Recruitment, Psychological tests and interviewing, Meaning and Importance of Placement and Induction, Employment Exchanges Act 1959, The Contract Labour Act 1970.

Training & Development [3L]:
Difference between training and Development, Principles of Training, Employee Development, Promotion-Merit v/s seniority Performance Appraisal, Career Development & Planning.

Job analysis & Design [2L]:

Job Analysis, Job Description & Job Description, Job Specification.

Job Satisfaction [8L]:
Job satisfaction and its importance, Motivation, Factors affecting motivation, introduction to Motivation Theory, Workers' Participation, Quality of work life. The Compensation Function: Basic concepts in wage administration, company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act 1936, Minimum Wages Act 1961.

Integration [8L]:
Human Relations and Industrial Relations, Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry, Employee Employer relationship Causes and Effects of Industrial disputes, Employees Grievances & their Redressal, Administration of Discipline, Communication in organization, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective Bargaining; Role of trade unions in maintaining cordial Industrial Relations.

Maintenance [8L]:
Fringe & retirement terminal benefits, Administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948, Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI Act 1948, Workmen's Gratuity Act 1972, Future challenges for Human Resource Management.

Text Books:
1.T.N.Chhabra-HumanResourceManagement, Dhanpat Rai & Co.

Reference Books:
1. Lowin B .Flippo –Principles of Personnel Management, McGraw-Hill
2. R.C.Saxena- Labour Problems and Social Welfare, K.Math & Co.
3. A Minappaand, M.S.Saiyada- Personnel Management, TataMc.Graw-Hill
4. C. B. Mamoria –Personnel Management, Himalaya Publishing House

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : DATA BASE MANAGEMENT SYSTEM LAB
SUBJECT CODE : IT691
YEAR : THIRD
SEMESTER : 6th Semester
CONTACT HOURS : 3P
CREDITS : 2

Perquisite: Knowledge about the basics of electronics and basic concepts in logic design, basic knowledge of data structure and programming concept.

Course Objective:
To develop conceptual understanding of database management system for solving different industry level problems & to learn its applications

Course Outcome:

After completion of this course student will be able to
IT691.1: Design and implement a database schema for a given problem-domain
IT691.2: Create and maintain tables using PL/SQL Course Outcome
IT691.3: Populate and query a database
IT691.4: Prepare reports
IT691.5: Application development using PL/SQL & front end tools

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT691.1	2		3	3	2							
IT691.2			3	3	2				2			
IT691.3	2		3	3	2					2		
IT691.4			3	3	2							2
IT691.5	2		3	3	2							2

Course Content:

1.Study of Backend Tool – Oracle.
2. Data Definition Language (DDL) commands in RDBMS.
3. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
4. High-level language extension with Cursors.
5. High level language extension with Triggers
6. Procedures and Functions.
7. Embedded SQL.
8. Database design using E-R model and Normalization.
9. Mini project (Application Development using Oracle and Visual Basic)
i.Inventory Control System.
ii.Material Requirement Processing
iii.Hospital Management System
iv.Railway Reservation System
v.Personal Information System
vi.Web Based User Identification System
vii.Time-table Management System

Text Book

1. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition

Reference Book

1. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill.
2. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : WEB TECHNOLOGY LAB
SUBJECT CODE : IT692
YEAR : THIRD
SEMESTER : 6th Semester
CONTACT HOURS : 3L
CREDITS : 3

Prerequisite: Basic knowledge on Java and computer networking and database.
Course Objective:
Describing the web application architecture and protocols.
Illustrating different technologies those are used to develop web applications
Describing different frameworks those used to develop web applications.

Course Outcome: At the end of the course students will be able to
IT692.1: understand and evaluate web application architecture, technologies and frameworks.
IT692.2: Apply the knowledge of web technology in developing web applications
IT692.3: Evaluate different solutions in field of web application development.
IT692.4: Implement small to large scale project to provide live solution in web application development fields.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO	PO10	PO11	PO12
IT692.1	2											
IT692.2	2	3	3	3	3							
IT692.3	2	3	3	3	3							
IT692.4	2	3	3	3	3				2	3		3

Course Contents:

HTML: Developing application using different HTML elements , Designing forms using HTML, Apply DOM

CSS: Using different CSS Styles for designing interactive forms and interfaces.

Java Script: Using Java script variables, operators, control structure, functions and event handling, Form validation using java script, Node js server implementation, express js for implementing web application handling get, put, post, etc.

JDBC: Connecting to databases using jdbc:odbc bridge and Type-4 drivers, Batch execution, Stored Procedure

Servlet: Developing web application using servlet: get/post, Developing filter application, Session handling.

JSP: Developing web application using JSP as view, Session handling using JSP, Using JSP components, Custom tag development.

Web Service: Development web service as reusable components

AJAX: Developing web application using AJAX: accessing XML, text files.

Text Book:
1.Professional Java Server Programming Allamaraju, aprerss

Reference Book:
1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning,
Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent
Learning Solutions INC.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **Computer Networking Lab**
SUBJECT CODE : **IT 693**
YEAR : **THIRD**
SEMESTER : **6th Semester**
CONTACT HOURS : **3P**
CREDITS : **2**

Prerequisite:
Basic Computer Architecture and Operating System.

Course Objective:
Understanding the basic concept of different network models, Explaining the network architecture, Apply different computer routing algorithms in real life problems.

Course Outcome
After completion of this course student will be able to

IT693.1: Understand and apply different network commands.

IT693.2: Analyze different networking functions and features for implementing optimal solutions.

IT693.3: Apply different networking concepts for implementing network solution.

IT693.4: Implement different network protocols.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT693.1	3	2	2	3	3							
IT693.2	3	2	2	3	3							
IT693.3	3	2	2	3	3							2
IT693.4	3	2	2	3	3							2

Course Content:

- Familiarization with: Different networking cables, Different connectors, Hubs, Switches, Routers
- NIC Installation & Configuration (Windows/Linux)
- Understanding IP address, subnet etc, Connect the computers in Local Area Network.
- Study of basic Network Configuration commands.
- Configure a Network topology using packet tracer software
- Link Layer Error Detection Mechanism (Cyclic Redundancy Check), Data Link Layer Error Control mechanism (Selective Repeat, Go Back N)
- Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window), Data
- Server Setup/Configuration: FTP, TELNET, NFS, DNS, Firewall.
- TCP/UDP Socket Programming: Simple, TCP based, UDP based Multicast & Broadcast Sockets

Text Books:

1. B. A. Forouzan – "Data Communications and Networking (5th Ed.) " – TMH
2. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

Reference Books:

1. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
2. Black, Data & Computer Communication, PHI
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : SYSTEM ENGINEERING LAB
SUBJECT CODE : IT 694
YEAR : THIRD
SEMESTER : 6th Semester
CONTACT HOURS : 3P
CREDITS : 2

Prerequisite:
Knowledge of Operating System, Computer Architecture, Computer Networking

Course Objective:
Understanding in details the embedded programming and embedded system, Explaining the circuit designing using raspberry pi, Preparing project on physical computing

Course Outcome
After completion of this course student will be able to
IT694.1: Understand and analyze the embedded systems
IT694.2: Understand and apply the embedded programming concepts
IT694.3: Analyze and evaluate solution in physical computing fields
IT694.4: Implement simple to critical circuit using embedded system.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT694.1:	2	3	3	3	3							
IT694.2:	2	3	3	3	3							
IT694.3:	2	3	3	3	3							
IT694.4:	2	3	3	3	3				3		3	3

Course Contents:

Embedded System: Embedded Programming, Embedded Device: Introduction to embedded devices, Types of different embedded device. Python: Your first program or C. Device Input output, Building Circuit on breadboard.

Introduction to the Internet of Things: – Evolution of internet – IoT case studies – Smart vehicles – smart buildings – health care – agriculture - Web based demo of IoT system
IoT Platforms

Raspberry Pi platform: Overview – Raspberry Pi board – Raspberry Pi processor – Raspberry Pi Operating System – Raspberry Pi Configuration and setup

General Purpose Input Output (GPIO): GPIO Pins - Protocol Pins – RPi.GPIO library – GPIO Access – Pulse Width Modulation - Blinking LED – GPIO Simulator

Hardware software interface: Programming device pin, managing memory (Python/C)

Networking IoT:
Overview – Protocols– TCP/IP – Sockets – Gateways – Routers - Standard network extensions of Raspberry Pi 3 - Ethernet - WiFi – Bluetooth - Communicating with Cloud

Final Project Preparation:

Text Books:

1. Programming the Raspberry pi Simon Monk

Reference Books:

1. Raspberry pi cook book Simon Monk
2. Paspberry pi Projects Dummies Mike Cook

.

7TH SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**E-COMMERCE**
SUBJECT CODE	**:**	**IT 701**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7^{th} Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Concepts of Computer Networking, Operating System, Database Management System

Course Objective:
Explain the characteristics and functions of electronic commerce including mobile commerce. Describe common business models used in B2C and B2B electronic commerce and security and payment process in electronic commerce including mobile commerce, identify the technology used in mobile commerce.

Course Outcome
After completion of this course student will be able to

IT701.1 Understand the policy issues related to privacy, intellectual property rights, and establishing identity those are germane to electronic commerce along with the Internet and related technologies.

IT701.2 Comprehend the underlying economic mechanisms and driving forces of E-Commerce;

IT701.3 Analyze the impact that electronic commerce is facing and outlines the different digital transaction process and basic concepts of e-commerce.

IT701.4 Identify the importance of digital library and specify the development of electronic commerce capabilities in a company.

IT701.5 Appraise the opportunities and potential to apply and synthesize a variety of e-Commerce and M-Commerce concepts and solutions to create business value for organizations, customers, and business partners.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT701.1	2			1	2	2	3	3			3	
IT701.2											3	1
IT701.3		1		2	2			2			3	2
IT701.4		2		3	3	1					2	2
IT701.5	2	2	2	2		3			1		2	3

Course Contents:

Introduction to E-Commerce [3L]
Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

Business to Business E-Commerce [7L]
Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce. Business models for E-commerce, Business Process Re-Engineering.

Legal issues [5L]
Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Security Issues [7L]
Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital ignature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security, Search engines, Intelligent agents in E-Commerce Electronic payment systems, E-security, Mobile commerce.

Business to Consumer E-Commerce and E-Business [7L]
Consumer trade transaction, Web metrics, Elements of E-Commerce, Industry impacts of E-business. Integrating Intranet and internet web applications across multiple networks. Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

Mobile Commerce [4L]
Overview, Infrastructure, Applications, Mobile Payment, Limitations, Security in M-Commerce

Text Books:
1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. Handbook on Electronic Commerce, Shaw et al., Springer publication.

Reference Books:
1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. Applied E-Commerce, Langer, John Wiley Publication.
3. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
4. Global Electronic Commerce- Theory and Case Studies by J. Christopher Westland and Theodore H. K Clark, University Press.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPUTER GRAPHICS AND MULTIMEDIA**
SUBJECT CODE	**:**	**IT702A**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Computer Programming, Mathematics

Course Objective:
The objective of the course is to provide comprehensive introduction about computer graphics system, design algorithms and two dimensional transformations; to make the students familiar with techniques of clipping, three dimensional graphics and three dimensional transformations and become familiar with various software programs used in the creation and implementation of multimedia and to gain knowledge about hardware devices and software used.

Course Outcome
After completion of this course student will be able to

IT702A.1: Know the foundations of computer graphics and Identify different media representations of different multimedia data and data formats.

IT702A.2: Comprehend the concept of geometric, mathematical and algorithmic concepts necessary for programming computer graphics.

IT702A.3: Understand the comprehension of windows, clipping and view-ports object representation in relation to images displayed on screen.

IT702A.4: Apply different coding technique for solving real world problems.

IT702A.5: Identify the software utilized in constructing computer graphics and multimedia applications.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT702A.1	2	3		2	1	2		1				
IT702A.2	2	2	1		3		2		1			
IT702A.3	2	2	3	3		1		1				
IT702A.4	3	1	2	2	2		1					2
IT702A.5	2	1	1		2							2

Course Contents:

TWO-DIMENSIONAL GRAPHICS: [7L]
Two dimensional geometric transformations, Matrix representations and homogeneous coordinates, composite transformations, Two dimensional viewing , viewing pipeline, viewing coordinate reference frame, window-to-viewport coordinate transformation, Two dimensional viewing functions, clipping operations, point, line, and polygon clipping algorithms.

ILLUMINATION AND COLOR MODELS: [7L]
Height sources, basic illumination models, halftone patterns and dithering techniques, Intuitive colour concepts, RGB colour model, YIQ colour model, CMY colour model, HSV colour model, HLS colour model, colour selection. Output primitives, points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms, Pixel addressing and object geometry.

THREE-DIMENSIONAL GRAPHICS: [7L]
Three dimensional concepts, Three dimensional object representations, Polygon surfaces, Polygon tables, Plane equations, Polygon meshes, Curved Lines and surfaces, Spline representations, Bezier curves and surfaces, B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations, Translation, Rotation, Scaling; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping.

MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING: [7L]
Multimedia basics, Multimedia applications, Multimedia system architecture, Evolving technologies for multimedia, Defining objects for multimedia systems, Multimedia data interface standards, Multimedia databases. Compression and decompression, Data and file format standards, Multimedia I/O technologies, Digital voice and audio, Video image and animation, Full motion video, Storage and retrieval technologies.

HYPERMEDIA: [7L]
Multimedia authoring and user interface, Hypermedia messaging, Mobile messaging, Hypermedia message component, Creating hypermedia message, Integrated multimedia message standards, Integrated document management, Distributed multimedia systems.

Text Books:

1. Hearn Baker Carithers, - "Computer Graphics with Open GL", Pearson New International Edition
2. Donald Hearn and Pauline Baker M, ―Computer Graphics", Prentice Hall, New Delhi, 2007
3. Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003

Reference Books:

1. Judith Jeffcoate, ―Multimedia in practice: Technology and Applications, PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, ―Computer Graphics: Principles and Practice, 2nd Edition, Pearson Education, 2003.
3. Jeffrey McConnel, ―Computer Graphics: Theory into Practice, Jones and Bartlett Publishers, 2006.
4. Hill F S Jr., "Computer Graphics", Maxwell Macmillan, 1990.
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, ―Fundamentals of Computer Graphics, CRC Press, 2010.
6. William M. Newman and Robert F.Sproul, ― Principles of Interactive Computer Graphics, Mc Graw Hill 1978.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**PATTERN RECOGNITION**
SUBJECT CODE	:	**IT 702B**
YEAR	:	**FORTH**
SEMESTER	:	**7^{th} Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:

Fundamentals of probability and linear algebra.

Course Objective:

The objective of this course is to learn the fundamentals of pattern recognition and its relevance to classical and modern problems. The main objective is to be able to identify where, when and how pattern recognition can be applied.

Course Outcome

After completion of this course student will be able to

IT702B.1: Understand basic concepts in pattern recognition.

IT702B.2: Formulate and describe various applications in pattern recognition.

IT702B.3: Gain knowledge about state-of-the-art algorithms used in pattern recognition research.

IT702B.4: Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis.

IT702B.5: Demonstrate successful applications to process and analyze images, and to make automatic decisions based on extracted feature information.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT702B.1	2											1
IT702B.2	2	2	2	1		1						
IT702B.3					3							
IT702B.4	2											
IT702B.5		3	2	2			1					2

Course Content:

Introduction to Pattern Recognition: [5L]

Importance of Pattern Recognition, Features, Feature Vectors, and Classifiers, Supervised, Unsupervised, and Semi-Supervised Learning

Classifiers Based on Bayes Decision Theory: [10L]

Introduction, Bayes Decision Theory: Minimizing the Classification Error Probability, Minimizing the Average Risk, Discriminant Functions and Decision Surfaces, Bayesian Classification for Normal Distributions: The Gaussian Probability Density Function, The Bayesian Classifier for Normally Distributed Classes, Decision Hyper planes, Minimum Distance Classifiers, Estimation of Unknown Probability Density Functions: Maximum Likelihood Parameter Estimation, Maximum a Posteriori Probability Estimation, Bayesian

Inference, Maximum Entropy Estimation, Mixture Models, T he Expectation Maximization (EM) Algorithm, Application to the Mixture Modeling Problem, Nonparametric Estimation, The Naive-Bayes Classifier, The Nearest Neighbor Rule, Bayesian Networks, Problems.

Linear Classifiers: [10L]

Introduction, Linear Discriminant Functions and Decision Hyperplanes, The Perceptron Algorithm: Proof of the Perceptron Algorithm Convergence, Variants of the Perceptron Algorithm, The Perceptron, The Pocket Algorithm, Kesler's Construction, Least Squares Methods: Mean Square Error Estimation, Multiclass Generalization, Stochastic Approximation and the LMS Algorithm, Sum of Error Squares Estimation, Mean Square Estimation Revisited: Mean Square Error Regression, MSE Estimates Posterior Class Probabilities, The Bias–Variance Dilemma, Logistic Discrimination, Support Vector Machines: Separable Classes, Nonseparable Classes, The Multiclass Case, ν-SVM, Support Vector Machines: A Geometric Viewpoint, Reduced Convex Hulls, Problems

Feature Selection: [10L]

Introduction, Preprocessing: Outlier Removal, Data Normalization, Missing Data, The Peaking Phenomenon, Feature Selection Based on Statistical Hypothesis Testing: Hypothesis Testing Basics- The Known Variance Case, The Unknown Variance Case, Application of the *t*-Test in Feature Selection. The Receiver Operating Characteristics (ROC) Curve, Class Separability Measures, Divergence, Chernoff Bound and Bhattacharyya Distance, Scatter Matrices, Feature Subset Selection: Scalar Feature Selection, Feature Vector Selection, Suboptimal Searching Techniques, Optimal Feature Generation, Neural Networks and Feature Generation/Selection,
Support Vector Machines: A Last Touch, The Bayesian Information Criterion

Text Books:

1. Pattern Recognition, S.Theodoridis and K.Koutroumbas, 4th Ed., Academic Press, 2009

Reference Books:

1. Pattern Recognition and Machine Learning, C.M.Bishop, Springer, 2006
2. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, John Wiley, 2001

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**INTERNET TECHNOLOGY**
SUBJECT CODE	:	**IT 702C**
YEAR	:	**FORTH**
SEMESTER	:	**7th Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:
Digital Electronics, Computer Networking, Web Technology

Course Objective:
Understanding advanced networking and web application development architecture; explaining the advanced routing protocols and .Net frame work; analyzing different networking concept and feature for developing solutions; analyzing different web application components for developing web application.

Course Outcome
After completion of this course student will be able to

IT702C.1: Understand advanced networking concepts and internet and web application architectures

IT702C.2: Analyze and understand different advanced routing protocols being used in web application development

IT702C.3: Analyze and evaluate different solution available in the field of networking and web application development such as http and the World Wide Web, HTML, and Java Scripts;

IT702C.4: Implement solution for different critical network related issues as; implementing the design using the client/server model, testing and documenting the solutions developed.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT702C.1	2	2	2	2								
IT702C.2	2	3	2	2	2							1
IT702C.3	3	3	3	2	2							1
IT702C.4	3	3	3	3	3						2	3

Course Content:

An Overview on Internet: [2L]
Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet.

Internet Address: [3L]
Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing. IPV6, Conversion from IPV4 to IPV6

Internet Protocol : [4L]
The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).

Routing: [4L]
The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to Gateway Protocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.

Internet Servers: [4L]
DNS, DHCP Servers, FTP, TELNET, E-Mail

Firewall & Networking :[8L]
Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.

ASP .NET : [10L]
Architecture and Component, Page life cycle, Control: Check Box, Radio Button, List, Label. Session Management, Web Form Handling, Accessing database, Hosting of Web application.

Text Books:
1.Computer Networks and Internets - Douglas E. Comer; PE.
2.ASP .NET Complete Reference Matthew MacDonald

Reference Books:
1. Communication Networks - Leon-Garcia-Widjaja; TMH.
2. Internetworking with TCP / IP - Douglas E .Comer; PE.
3. TCP/IP protocol suite - Forouzan Behrouz A; TMH.
4. Computer Networks – Andrew S. Tanenbaum; PHI.
5. Data and Computer Communication - William Stallings; PHI.
6. The Complete reference of Networking - Craig Zacker; TMH.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **CLOUD COMPUTING**
SUBJECT CODE : **IT 703A**
YEAR : **FORTH**
SEMESTER : **7th Semester**
CONTACT HOURS : **3L**
CREDITS : **3**

Prerequisite:
Computer Networking, Operating System

Course Objective:

The objective of the course is to introduce and describe cloud computing architecture, models and security issues and service level agreements.

Course Outcome
After completion of this course student will be able to
IT703A.1: Understand the basic architecture of cloud computing

IT703A.2: Analyze different problems in the domain of cloud computing.
IT703A.3: Apply the knowledge of cloud computing in the evaluation of the computing model.
IT703A.4: Evaluate the different models and solutions provided in the field of cloud computing.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT703A.1	3	3										
IT703A.2	3	3	3	2	3							
IT703A.3	3	3	3	2	3							2
IT703A.4	3	3	3	3	2							

Course Content:

Overview of Computing Paradigm: [2L]
Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing Evolution of cloud computing Business driver for adopting cloud computing

Introduction to Cloud Computing: [3L]
Cloud Computing (NIST Model)Introduction to Cloud Computing, History of Cloud Computing,
Cloud service providers Properties, Characteristics And Disadvantages Pros and Cons of Cloud
Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing Role of Open Standards

Cloud Computing Architecture: [4L]
Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services Service Models (XaaS) Infrastructure as a Service(IaaS) Platform as a Service(PaaS) Software as a Service (SaaS) Deployment Models Public cloud Private cloud Hybrid cloud Community cloud

Infrastructure as a Service: [5L]
Introduction to IaaS: IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM) Resource Virtualization Server Storage Network Virtual Machine(resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service) Examples Amazon EC2Renting, EC2 Compute Unit, Platform and Storage, pricing, customers Eucalyptus

Platform as a Service: [4L]
Introduction to PaaS, Service Oriented Architecture (SOA) Cloud Platform and Management Computation Storage Examples Google App Engine Microsoft Azure

Software as a Service: [4L]
Introduction to SaaS Web services Web 2.0 Web OS Case Study on SaaS

Service Management in Cloud Computing: [5L]
Service Level Agreements Billing And Accounting Comparing Scaling Hardware: Traditional vs. Cloud Economics of scaling: Benefitting enormously Managing Data Looking at Data, Scalability And Cloud Services Database And Data Stores in Cloud Large Scale Data Processing

Cloud Security: [6L]
Infrastructure Security Network level security, Host level security, Application level security Data security and Storage Data privacy and security Issues, Jurisdictional issues raised by Data location Identity And Access Management Access Control Trust, Reputation, Risk Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

Case Study on Open Source And Commercial Clouds: [2L]
Eucalyptus Microsoft Azure Amazon EC2

Text Books:

1. 1.Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

Reference Books:

1. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee
   Gillam, Springer, 2012
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**DISTRIBUTED SYSTEM**
SUBJECT CODE	:	**IT 703B**
YEAR	:	**FORTH**
SEMESTER	:	**7^{th} Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:
Operating System, Computer Networking

Course Objective: This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission

Course Outcome
After completion of this course student will be able to

IT703B.1: Understand the knowledge of the basic elements and concepts related to distributed system technologies for identify core architectural aspects of distributed systems;
IT703B.2: Design and implement distributed applications;
IT703B.3: Identify the main underlying components of distributed systems (such as RPC, file systems) and use those components for building a distributed system
IT703B.4: Use and apply important methods in distributed systems to support scalability and fault tolerance;
IT703B.5: Demonstrate experience in building large-scale distributed applications.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT703B.1	3											
IT703B.2	2	2	3	3	3							
IT703B.3	2											
IT703B.4	3	2		2								2
IT703B.5	2		3	2	1	1					2	2

Course Content:
Introduction to distributed Systems: [2L]
Definition and goals, Hardware and Software concepts, Design issues

Communication in Distributed System: [4L]
Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC

Synchronization in Distributed Systems: [4L]
Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems

Processes and Processors in Distributed Systems: [3L]
Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues

Distributed File Systems: [4L]
Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study

Distributed Shared Memory: [5L]
Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing.

Naming: [4L]
Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS.

Distributed Web-based Systems: [3L]
Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication: Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications

Security: [3L]
Introduction of Security in Distributed OS, Overview of security techniques, features, Need, Access Control, Security Management

Case Study: [3L]
Oracle Network File System, Google case study

Text Books:
1. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
2. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore,Tim Kindberg, Pearson

Reference Books:
1. Distributed Operating Systems by Andrew S Tannebaum, Pearson

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **DATA WAREHOUSING AND DATA MINING**
SUBJECT CODE : **IT703C**
YEAR : **FORTH**
SEMESTER : **7th Semester**
CONTACT HOURS : **3L**
CREDITS : **3**

Prerequisite:

Database Management System, Mathematics

Course Objective:
The student should be made to be familiar with the concepts of data warehouse and data mining and be acquainted with the tools and techniques used for knowledge discovery in databases

Course Outcome
After completion of this course student will be able to
IT703C.1: Understand the concepts of data warehousing and data mining
IT703C.2: Understand and apply the dimensional modeling technique for designing a data warehouse applying warehouse architectures
IT703C.3: Apply OLAP and the project planning aspects in building a data warehouse and. explain the knowledge discovery process
IT703C.4: Identify and apply the data mining tasks and study their well-known techniques
IT703C.5: Develop an understanding of the role played by knowledge in a diverse range of intelligent systems

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT703C.1	3											
IT703C.2	3			1								
IT703C.3	2	1	2	1	3							
IT703C.4	2	1										
IT703C.5	2	2	3	2	2	2						2

Course Content:

DATA WAREHOUSING: [7L]
Data Warehousing Components, Building A Data Warehouse, Mapping The Data Warehouse To A Multiprocessor Architecture, DBMS Schemas For Decision Support, Data Extraction, Cleanup, And Transformation Tools, Metadata.

BUSINESS ANALYSIS: [7L]
Reporting And Query Tools And Applications, Tool Categories, The Need For Applications, Cognos Impromptu, Online Analytical Processing (OLAP), Need, Multidimensional Data Model, OLAP Guidelines, Multidimensional Versus Multi-relational OLAP, Categories of Tools, OLAP Tools And The Internet.

DATA MINING: [7L]
Introduction, Data Types, Data Mining Functionalities, Interestingness of Patterns, Classification Of Data Mining Systems, Data Mining Task Primitives, Integration Of A Data Mining System With A Data Warehouse, Issues, Data Pre-processing.

ASSOCIATION RULE MINING AND CLASSIFICATION: [7L]
Mining Frequent Patterns, Associations And Correlations, Mining Methods, Mining Various Kinds Of Association Rules, Correlation Analysis, Constraint Based Association Mining, Classification And Prediction, Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification By Back Propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction.

CLUSTERING AND TRENDS IN DATA MINING: [7L]
Cluster Analysis, Types Of Data, Categorization Of Major Clustering Methods, K-Means, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint, Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

Text Books:

1. Alex Berson And Stephen J.Smith, “Data Warehousing, Data Mining And OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han And Micheline Kamber, “Data Mining Concepts And Techniques”, Third Edition, Elsevier, 2012.

Reference Books:

1. Data Mining, Practical Machine Learning Tools and Techniques, Third Edition; Ian H.
2. Witten, Eibe Frank, Mark A. Hall
3. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and
4. Stephen J. Smith, TataMcGraw Hill Education
5. Data warehouse Toolkit by Ralph Kimball, Wiley India
6. Data Warehousing in the real world; Anahory; Pearson Education.

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **MODELLING AND SIMULATION**
SUBJECT CODE : **IT704A**
YEAR : **FORTH**
SEMESTER : **7th Semester**
CONTACT HOURS : **3L**
CREDITS : **3**

Prerequisite:
Programming and Data Structures, Discrete Mathematics and Probability, Numerical Analysis, Basic Electronics

Course Objective:
The objective of the course is to conceptualize basics of simulation and modeling for applying dynamic and probability concept of simulation and discrete simulation system; to enable students to analyze Continuous Uniformly Distributed Random Numbers and to assess the strengths and weaknesses of various methods and to analyze their behavior.

Course Outcome
After completion of this course student will be able to
IT704A.1: Summarize the issues in Modeling and Simulation

IT704A.2: Explain the System Dynamics & Probability concepts in Simulation.

IT704A.3: Solve the Simulation of Queuing Systems

IT704A.4: Analyze the Simulation output

IT704A.5: Identify the application area of Modeling and Simulation and apply in the corresponding fields

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT704A.1	3	3	2									
IT704A.2	3	2	3	2	3							2
IT704A.3	3	3	2	2	3							2
IT704A.4	3	3	2	2	3							2
IT704A.5	2	3	2	2	3							2

Course Content:

Introduction to Modeling and Simulation: [10L]
Nature of Simulation. Systems, Models and Simulation, Continuous and Discrete Systems, system modeling, Components of a simulation study, Introduction to Static and Dynamic System simulation , Application areas, Advantages, Disadvantages and pitfalls of Simulation.

System Dynamics & Probability concepts in Simulation: [10L]
Exponential growth and decay models, Generalization of growth models, Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.

Simulation of Queuing Systems and Discrete System Simulation: [10L]

Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system. Discrete Events ,Generation of arrival patterns ,Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization , Recording Distributions and Transit times.

Analysis of Simulation output: [5L]
Sensitivity Analysis, Validation of Model Results

Text Books:

1. Jerry Banks, John Carson, B.L.Nelson and D.M.Nicol " Discrete Event System Simulation", Fifth Edition, Pearson
2. Narsingh Deo, 1979, System Simulation with Digital Computers, PHI.

Reference Books:

1. Geoffrey Gordon, "System Simulation", PHI.
2. Averill M. Law and W.David Kelton, "Simulation Modelling and Analysis", Third Edition, McGraw Hill
3. J. N. Kapoor.. Mathematical Modelling, Wiley eastern Limited.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**CONTROL SYSTEM**
SUBJECT CODE	**:**	**EE(IT)704B**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7^{th} Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Basic Electrical Engineering, Mathematics

Course Objective:

Understanding and explaining basic of control system; explaining and analyzing transfer function, and time and frequency domain response; analyzing control system design technique.

Course Outcome
After completion of this course student will be able to

EE(IT)704B.1: Understand and explain basic structure of control systems, basic terminologies, components.

EE(IT)704B.2: Represent physical systems into transfer function form and thus can analyze system dynamic and steady state behavior.

EE(IT)704B.3: Analyze system stability and design controllers, compensators in frequency domain.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE(IT)704B.1		2										
EE(IT)704B.2	3	2		2								
EE(IT)704B.3	3	2	2	2	2							

Course Content:
Introduction: [4L]
Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

Transfer Function Representation: [4L]
Transfer Function of linear systems, Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

Time Response Analysis: [4L]
Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants.

Stability Analysis In S-Domain: [5L]
The concept of stability – Routh's stability criterion – limitations of Routh's stability. Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

Frequency Response Analysis: [5L]
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

Stability Analysis In Frequency Domain: [4L]
Polar Plots, Nyquist Plots Stability Analysis.

Classical Control Design Techniques: [4L]
Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

State Space Analysis Of Continuous Systems: [5L]
Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability

Text Books:

1.Automatic Control Systems 8th edition– by B. C. Kuo 2003– John Wiley

Reference Books:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems Engg. by NISE 3rd Edition – John Wiley

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MICROELECTRONICS AND VLSI DESIGN**
SUBJECT CODE	**:**	**ECE(IT)704C**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7^{th} Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Digital Electronics, Microprocessor, Computer Architecture.

Course Objective:
The course is designed to give the student an understanding of the different design steps required to carry out a complete digital VLSI design in silicon.

Course Outcome
After completion of this course student will be able to

ECE(IT)704C.1: Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect

ECE(IT)704C.2: Create models of moderately sized CMOS circuits that realize specified digital functions

ECE(IT)704C.3: Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects

ECE(IT)704C.4: Understand of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes

ECE(IT)704C.5: Complete a significant VLSI design project having a set of objective criteria and design constraints

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ECE(IT)704C.1	3	2		2								
ECE(IT)704C.2	2		3	2	1							
ECE(IT)704C.3	2	3		2	1							
ECE(IT)704C.4	3	2		2								
ECE(IT)704C.5	2				2			2	2	2		2

Course Content:

Introduction to VLSI Design: [10L]
VLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical), YChart, Digital VLSI Design Steps. MOS structure: E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flat-band voltage, Potential balance & Charge balance, Inversion, MOS capacitances.

Micro-electronic Processes for VLSI Fabrication: [10L]
Silicon Semiconductor Technology- An Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion, Cleaning, Etching, Photo-lithography – Positive & Negative photo-resist Basic CMOS Technology (Steps in fabricating CMOS), Basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator Layout Design Rule: Stick diagram with examples, Layout rules.

Three Terminal MOS Structure: [10L]
Body effect. Four Terminal MOS Transistor: Drain current, I-V Characteristics. Current-voltage equations (simple derivation). Scaling in MOSFET: Short Channel Effects, General scaling, Constant Voltage & Field scaling. CMOS: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate using CMOS.

Hardware Description Language: [5L]
VHDL or Verilog Combinational & Sequential Logic circuit Design.

Text Books:
1. CMOS Digital Integrated Circuit, S.M.Kang & Y.Leblebici, TMH.
2. Modern VLSI Design, Wayne Wolf, Pearson Education.

Reference Books:
1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.
2. Advance Digital Design Using Verilog , Michel D. Celliti, PHI
3. VHDL, Bhaskar, PHI.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**MOBILE COMMUNICATION**
SUBJECT CODE	:	**IT704D**
YEAR	:	**FORTH**
SEMESTER	:	**7th Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:
Computer Networking, Operating System, Mathematics.

Course Objective:
The objective of the course is to presents the basic principles of mobile communication systems, analysis the operation of mobile communications system with wireless media.

Course Outcome
After completion of this course student will be able to

IT704D.1: Explain the limitations of fixed networks; the need and the trend toward mobility; the concepts portability and mobility.

IT704D.2: Describe and analyze the network infrastructure requirements to support mobile devices and users.

IT704D.3: Illustrate the concepts, techniques, protocols and architecture employed in wireless local area networks, cellular networks, and perform basic requirements analysis.

IT704D.4: Apply techniques and technologies to design and communicate a simple mobile application for smaller devices.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT704D.1	3			2	2							
IT704D.2	1	2		2	3							
IT704D.3	1		3	3	2							
IT704D.4	3	2	2		3							2

Course Content:

Overview: [5L]
History, Transmission Medium, Need, Advantages, Disadvantages. Introduction to Personal Communications Services: PCS Architecture, Mobility management, Networks signaling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.

General Packet Radio Services: [9L]
GPRS Architecture, GPRS Network Nodes. Wireless LANs [6L]: Characteristics, IEEE 802.11: Architecture, Physical Layer, MAC Layer, And MAC Management, 802.11a and 802.11b. HIPERLAN: History, WATM, BRAN and HiperLAN2.Bluetooth: Architecture, Radio Layer, Baseband Layer, Link Management Protocol, L2CAP and Security.

Network Layer: [10L]
Introduction, Traditional TCP: Congestion Control, Slow Start, Fast Retransmit and Implications of Mobility. Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP and Fast Retransmit. Mobile IP: Introduction, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations and Reverse Tunneling. Mobile Ad-hoc Networks: Routing, Destination Sequence Distance Vector, Dynamic Source Routing and Alternative Metrics.

Cellular Networks: [8L]
Cellular Concept, Frequency Reuse, Channel Allocation Management, Call Setup, Location Management, Cell Handoffs, Interference: Co-channel and Adjacent Interference. System Capacity, Improving Cell Capacity and Coverage: Cell Splitting, Sectoring, Repeaters and Microcell Zone Concept

Wireless Application Protocol: [3L]
The Mobile Internet standard, WAP Gateway and Protocols,

Text Books:

1. J. Schiller, Mobile Communications, Addison –Wesley, 2003

Reference Books:

1. T. S. Rapport, Wireless Communications, Principle and Practices
2. Forouzan, Data Communications and Networking, TMH

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**E-COMMERCE LAB**
SUBJECT CODE	**:**	**IT 791**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7^{th} Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Object Oriented Programming, Computer Networking, Web Application Development, Database Management System.

Course Objective:
Understanding basic concept of object oriented programming and PHP framework, explaining the client side components, applying the PHP web application development concept in web application development.

Course Outcome
After completion of this course student will be able to

IT791.1: Understand the concept of PHP framework.

IT791.2: Analyzing different client and server side components for developing application and build dynamic web site using server side PHP programming and database connectivity

IT791.3: Apply and concept for developing MVC application and describe and differentiate different Web Extensions and Web Services.

IT791.4: Apply and implement the solution to real life problem using PHP concepts and Demonstrate web application using Python web Framework.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT791.1	2		3	2								
IT791.2	2	3	3	3	3							3
IT791.3	2	3	3	3	3							3
IT791.4	2	3	3	3	3				3		3	3

Course Content:

Introduction to PHP: Evaluation of PHP, Basic syntax, Variable constant, Data Types, control structure, function, array, string.

Introduction to OOPS: Introduction objects declaring a class The new keyword and constructor destructor access method and properties using this variable public, private, protected properties and methods Static properties and method Class constant Inheritance & code reusability Polymorphism Parent & self keyword Instance of operator Abstract method and class Interface Final, Understanding Exception and error Try, catch, throw.

Web Designing: Introduction to HTML: HTML Tags Creating Forms Creating tables Managing home page, Java Script, CSS.

Database Connectivity with MySQL: Introduction to RDBMS Connection with MySql: Database Performing basic database operation(DML) (Insert, Delete, Update, Select) Setting query parameter Executing query Join (Cross joins, Inner joins, Outer Joins, Self joins.)

MVC: Request & Response Parameter Controller Action Request Life Cycle callbacks Controller method Redirection Working with component, Creating Model for Database Table Retrieving Data Using Model Method for all Basic CURD(Create ,Read, Update, Delete) Create own Model method Making custom SQL Queries Data Validation, Working with Simple association one to-one, one-to-many, many-to-many, Working with layout Create custom Layout Working with Helper class Creating and using user define Helper Working with element

E-Commerce/M-Commerce Applications: Online Store, Online Banking, Credit Card Transaction Processing. Comparison Shopping in B2C, Exchanges Handling in B2B, Interaction Examples: Virtual Shopping Carts.

Text Books:

1. Learn PHP, MySQL, Java Script, by Robin Nixon, Oreilly Publications
2. PHP Complete Refernce by Steven Holzner

Reference Books:

1. Programming PHP by Kevin Tatroe

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : COMPUTER GRAPHICS AND MULTIMEDIA LAB
SUBJECT CODE : IT792A
YEAR : FORTH
SEMESTER : 7th Semester
CONTACT HOURS : 3P
CREDITS : 2

Prerequisite:
Computer Programming, Mathematics

Course Objective:
The objective of the course is to become familiar with graphics programming and expertise in text, image, audio, video enhancement and manipulation using different software/tools through projects.

Course Outcome
After completion of this course student will be able to

IT792A.1: Create 3D graphical scenes using open graphics library suits

IT792A.2: Analyze the effects of scale and use on both presentation and lower level requirements

IT792A.3: Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.

IT792A.4: Implement image manipulation, enhancement, and basic transformations on objects and clipping algorithm on lines

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT792A.1	1	3	2	3	1	2						
IT792A.2	1	2	3	2	2							
IT792A.3	2	3	2	1	1							1
IT792A.4	1	1	1	1	1							2

Course Content:
IMPLEMENT THE EXERCISES USING C /C++/ OPENGL / JAVA

- Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes, Circle (Midpoint)
- 2D Geometric transformations – Translation, Rotation Scaling , Reflection Shear, Window-Viewport
- Composite 2D Transformations
- Line Clipping
- 3D Transformations - Translation, Rotation, Scaling.
- 3D Projections – Parallel, Perspective.
- Creating 3D Scenes.
- Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
- 2D Animation – To create Interactive animation using any authoring tool.
- VLC and Video Streaming

- HTML 5 and media publishing with Projects based learning.
- Web document creation using Dreamweaver.
- Creating Animation using Flash.

Text Books:

1. Hearn Baker Carithers, - “Computer Graphics with Open GL”, Pearson New International Edition

Reference Books:

1. Donald Hearn and Pauline Baker M, ―Computer Graphics”, Prentice Hall, New Delhi, 2007
2. Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PATTERN RECOGNITION LAB**
SUBJECT CODE	**:**	**IT 792B**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:

Mathematics, Image Processing.

Course Objective:

The objective of this course is to understand various features representation techniques and to analyze different pattern recognition techniques.

Course Outcome

After completion of this course student will be able to

IT792B.1: Understand pattern recognition concepts.

IT792B.2: Analyze pattern recognition techniques.

IT792B.3: Apply different pattern recognition technique for providing solution.

IT792B.4: Implement solution to real life problem using pattern recognition techniques.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT792B.1	2				2	2						2
IT792B.2		3	2	3								
IT792B.3	2	2	2	3	2							
IT792B.4		2	2	2	3	3			3		2	2

Course Content:

Environment : MAT LAB

1. Feature Representation
2. Mean and Covariance
3. Linear Perceptron Learning
4. Generation of Random Variables
5. Bayesian Classification
6. MLE: Learning the classifier from data
7. Data Clustering: K-Means, MST-based

Text Books:

1. Pattern Recognition , S.Theodoridis and K.Koutroumbas, 4th Ed., Academic Press , 2009.

Reference Books:

1. Pattern Classification, R.O.Duda, P.E Hart and D.G Stork, Johm Wiley,2001.

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : INTERNET TECHNOLOGY LAB
SUBJECT CODE : IT792C
YEAR : FORTH
SEMESTER : 7th Semester
CONTACT HOURS : 3P
CREDITS : 2

Prerequisite:
Computer Networking, Web Technology

Course Objective:

The objective of the course is to make students understand different routing algorithm and mail server configurations and explaining C# and .NET Frame work for implementing web applications

Course Outcome
After completion of this course student will be able to

IT792C.1: Understanding and apply the basic networking concepts for configuration of network server and routing protocols.

IT792C.2: Analyzing and understanding the concept of .NET framework

IT792C.3: Apply the concept of .NET for implementing web applications

IT792C.4: Evaluate different web application to implement optimal solutions for real life problems.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT792C.1	2	3	2	3	3							
IT792C.2	2	3	2	3	3							
IT792C.3	2	3	3	3	3							
IT792C.4	2	3	3	3	3				3		3	3

Course Content:

Configuration of Routing Protocol
Configure, implement and debug the following: Use open source tools for debugging and diagnostics. a. ARP/RARP protocols b. RIP routing protocols c. BGP routing d. OSPF routing protocols e. Static routes (check using netstat)

Mail Server Configuration
Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mails.

C#
Getting Started with .Net Framework, Exploring Visual Studio .NET, Inside a C# Program, Data Types, Statements, Arrays, Using Strings, Objects, Classes and Structs, Properties, Inheritance, Indexers, Delegates, Events, Namespaces, Generics, Collections and Data Structures, Exception Handling, Threading, Using Streams and Files, Reflection, Assemblies, versioning, Windows Forms, Controls, Data binding to Conrols, Advanced Database Programming using ADO.net, Using GDI +,Networking,.net Remoting, Manipulating XML.

ASP.NET

Building a Web Application, Examples Using Standard Controls, Using HTML Controls, Validating Form Input Controls using Validation Controls, Understanding Applications and State, Applying Styles, Themes, and Skins, Creating a Layout Using Master Pages, Binding to Databases using Controls, Data Management with ADO.net, Creating a Site Navigation Hierarchy, Navigation Controls , Membership and Role Management, Login Controls, Securing Applications, Caching For Performance, Working with XML, Using Crystal Reports in Web Forms

DBMS

Introduction, Using SQL to work with database, retrieving and manipulating data with SQL, working with ADO.NET, ADO.NET architecture, ASP.NET data control, data source control, deploying the web site. Crystal reports. LINQ: Operators, implementations, LINQ to objects, XML, ADO.NET, Query Syntax.

Text Books:

1. Beginning ASP.NET 4 in C# 2010 Matthew MacDonald

Reference Books:

1. 1.ASP .NET Complete Reference Matthew MacDonald
2. 2.C# Complete Reference Herbert Schildt

8TH SEMESTER

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**ADVANCED COMPUTER ARCHITECTURE**
SUBJECT CODE	:	**IT801A**
YEAR	:	**FORTH**
SEMESTER	:	**8th Semester**
CONTACT HOURS	:	**3L**
CREDITS	:	**3**

Prerequisite:
Mathematics **,** Computer Organization and Architecture,

Course Objective:

The objective of the course is to learn technical competence in computer architecture and performance comparisons of modern and high performance computer systems.

Course Outcome:
After completion of this course student will be able to
IT801A.1: Understand the operations of modern and high performance computer systems.
IT801A.2: Identify cache and memory related issues in multi-processors architecture.
IT801A.3: Evaluate performance of different architectures with respect to various parameters.
IT801A.4: Analyze performance of different ILP techniques of computer architecture.
IT801A.5: Design the mechanism by which the performance of the system is enhanced.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT801A.1	2	1										1
IT801A.2	2	2	1									
IT801A.3	3	2	2	1	2							
IT801A.4	2	3	3	2	2							1
IT801A.5	2	3	3	2	2							1

Course Content:

Module 1: [7L]
Fundamentals of Computer Design: Review of Fundamentals of CPU, Memory and I/O, Trends in technology, power, energy and cost, Dependability, Performance Evaluation

Module 2: [7L]
Instruction Level Parallelism: ILP concepts, Pipelining overview ,Compiler Techniques for Exposing ILP, Dynamic Branch Prediction, Dynamic Scheduling, Multiple instruction Issue, Hardware Based Speculation, Static scheduling, Multi-threading, Limitations of ILP, Case Studies.

Module 3: [7L]
Data Level Parallelism: Vector architecture, SIMD extensions, Graphics Processing units, Loop level Parallelism.

Module 4: [7L]
Thread Level Parallelism: Symmetric and Distributed Shared Memory Architectures, Performance Issues, Synchronization, Models of Memory Consistency, Case studies: Intel i7 Processor, SMT & CMP Processors

Module 5: [7L]
Memory and I/O: Cache Performance, Reducing Cache Miss Penalty and Miss Rate, Reducing Hit Time, Main Memory and Performance, Memory Technology. Types of Storage Devices, Buses, RAID, Reliability, Availability and Dependability, I/O Performance Measures.

Text Books:

1. Kai Hwang and Faye Briggs, "Computer Architecture and Parallel Processing", Mc Graw-Hill International Edition, 2000.
2. Sima D, Fountain T and Kacsuk P, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.

Reference Books:

1. Parallel Computer Architecture: D. Culler, J.P.Singh, A.Gupta, Elsevier

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : CRYPTOGRAPHY AND NETWORK SECURITY
SUBJECT CODE : IT801B
YEAR : FORTH
SEMESTER : 8th Semester
CONTACT HOURS : 3L
CREDITS : 3

Prerequisite:

Mathematics, Computer Networking,

Course Objective:

The objective of the course is to study the about how to maintain the Confidentiality, Integrity and Availability and Authenticity of the data over insecure channel by various means and to understand various protocols for network security to protect against the threats in the networks.

Course Outcome:
After completion of this course student will be able to
IT801B.1: Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks.
IT801B.2: Analyze existing authentication and key agreement protocols, identify the weaknesses of these protocols.
IT801B.3: Develop SSL or Firewall based solutions against security threats, employ access control techniques to the existing computer platforms.
IT801B.4: Write an extensive analysis report on any existing security product or code, investigate the strong and weak points of the product or code.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT801B.1	2	3	2									
IT801B.2	2	3	3	2	1	1	1					
IT801B.3	2	2	3	3	2							
IT801B.4	2	3	3	2	2	1	1					3

Course Content:

Module 1: [5L]
Attacks on Computers & Computer Security Introduction, Need for Security, Security approaches, Principles of Security, Types of attack.

Module 2: [7L]
Cryptography: Concepts & Techniques Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, and Symmetric & Asymmetric key Cryptography, Key Range & Key Size

Module 3: [8L]
Symmetric Key Algorithm Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES (Data Encryption Standard) algorithm, IDEA (International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.

Module 4: [5L]
Asymmetric Key Algorithm, Digital Signature and RSA Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).

Module 5: [6L]
Internet Security Protocols, User Authentication Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.

Module 6: [4L]
Electronic Mail Security Basics of mail security, Pretty Good Privacy, S/MIME.

Module7: [3L]
Firewall Introduction, Types of firewall, Firewall Configurations, DMZ Network

Text Books:
1. Cryptography and Network Security, William Stallings, 2nd Edition, Pearson Education Asia
2. Network Security private communication in a public world, C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: Atul Kahate, TMH.

Reference Books:
1. Network Security Essentials: Applications and Standards by William Stallings, Pearson
2. Designing Network Security, Merike Kaeo, 2nd Edition, Pearson Books
3. Building Internet Firewalls, Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition
4. Practical Unix & Internet Security, Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

STREAM : **INFORMATION TECHNOLOGY**
SUBJECT NAME : **NATURAL LANGUAGE PROCESSING**
SUBJECT CODE : **IT801C**
YEAR : **FORTH**
SEMESTER : **8th Semester**
CONTACT HOURS : **3L**
CREDITS : **3**

Prerequisite:
Mathematics, Computer Programming, Formal Language and Automata Theory

Course Objective:
The objective of the course is to learn the basics of NLTK toolkit, principles of NLP through programming, to build an application using different algorithms and natural language processing techniques.

Course Outcome:
After completion of this course student will be able to

IT801C.1: Understand the models, methods, and algorithms of statistical Natural Language Processing (NLP) for common NLP tasks.

IT801C.2: Apply core computer science concepts and algorithms in the processing of natural language.

IT801C.3: Apply the methods to new NLP problems and will be able to apply the methods to problems outside NLP.

IT801C.4: Familiar with research field and able to implement a system which processes a natural language

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT801C.1	2	2	3	2	2							
IT801C.2	3	3	3	3	3							
IT801C.3	3	3	3	3	3							
IT801C.4	2	3	2	2	3							2

Course Content:

Module I: [5L]
Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art and the Near-Term Future. Regular Expressions and Automata: Regular Expressions, Finite-State Automata, Regular Languages and FSAs.

Module II: [5L]
Word Classes and Part-of –Speech Tagging: (Mostly) English Word Classes, Tagsets for English, Part-of –Speech Tagging, Rule-Based Part-of –Speech Tagging, Stochastic Part-of –Speech Tagging, Transformation-Based Tagging, Other Issues.

Module III: [5L]
Context-Free Grammars for English: Constituency, Context-Free Rules and Trees, Sentences-Level Constructions, The Noun Phrase, Coordination, Agreement, The Verb Phrase and Sub categorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence and Normal Form, Finite-State and Context- Free Grammars, Grammars and Human Processing.

Module IV: [5L]

Parsing with Context-Free Grammars: Parsing as Search, A Basic Top-Down Parser, Problems with the Basic Top-Down Parser, The Early Algorithm, Finite – State Parsing Methods.

Module V: [5L]

Features and Unification: Feature Structures, Unification of Features Structures, Features Structures in the Grammar, Implementing Unification, Parsing with Unification Constraints, Types and Inheritance.

Module VI: [5L]

Representing Meaning: Computational Desiderata for Representations, Meaning Structure of Language, First Order Predicate Calculus, Some Linguistically Relevant Concepts. Semantic Analysis: Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Integrating Semantic Analysis into the Early Parser, Idioms and Composionality, Robust Semantic Analysis.

Module VII: [7L]

Discourse: Reference Resolution, Text Coherence, Discourse Structure, Psycholinguistic Studies of Reference and Coherence. Natural Language Generation: Introduction to Language Generation, An Architecture for Generation, Surface Realization, Discourse Planning, Other Issues.

Text books:

1. Steven Bird, Ewan Klein, and Edward Loper. "Natural Language Processing– Analyzing Text with the Natural Language Toolkit". 2009, O'Reilly, 1ed.
2. Robert Dale, Hermani Moisi, Harold Somers, Handbook Of Natural Language Processing, Markcel Dekker Inc.

Reference books:

1. Ruslan Mitkov, The Oxford Handbook Of Computational Linguistics, Oxford Universitty Press, 2003.
2. Daniel Jurafsky,James Martin, Speech and Language Processing,Prentice Hall,
3. James Allen, Natural Language Processing, Pearson Education, 2003.
4. Christopher D.Manning & Henrich Schutze, Foundations Of Statistical Natural Language Processing, The MIT Press, 2001
5. Douglas Biber, Susan Conrad, Randi Reppen, Corpus Linguistics – Investigating Language Structure And Use, Cambridge University Press, 2000.
6. David Singleton, Language And The Lexicon: An Introduction, Arnold Publishers, 2000.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BIO-INFORMATICS**
SUBJECT CODE	**:**	**IT801D**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8^{th} Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Concepts of Computer Networking, Network Security, Database Management Systems

Course Objective:

The basic objective is to learn about different bio molecules, their structures and functions, various data sets in bioinformatics, computational techniques useful in bioinformatics.

Course Outcome:
After completion of this course student will be able to

IT801D.1: Acquire the knowledge of Bioinformatics technologies with the related concept of DNA, RNA and their implications

IT801D.2: Understand the concept and techniques of different types of Data Organization and Sequence Databases with different types of Analysis Tools for Sequence Data Banks

IT801D.3: Acquire the knowledge of the DNA Sequence Analysis

IT801D.4: Analyze the performance of different types of Probabilistic models used in Computational Biology

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT801D.1	3	1	1	1								1
IT801D.2	3	2	2	2								
IT801D.3	2	2	2	2								1
IT801D.4	2	2	2	2								1

Course Contents

Introduction To Molecular Biology: [5L]
Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles. Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept. Concepts of RNA : Basic structure, Difference between RNA and DNA. Types of RNA. Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Tranlation Introduction to Metabolic Pathways.

Sequence Databases: [4L]
Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank, OMIM, Taxonomy browser, PubMed

DNA Sequence Analysis: [14L]
DNA Mapping and Assembly: Size of Human DNA ,Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules. DeBruijn Graph. Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignment,

Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.

Introduction Probabilistic models used in Computational Biology [8L]
Probabilistic Models; Hidden Markov Model : Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bioinformatics : Genefinding, profile searches, multiple sequence alignment and regulatory site identification. Bayesian networks Model :Architecture, Principle ,Application in Bioinformatics.

Biological Data Classification and Clustering : [4L]
Assigning protein function and predicting splice sites: Decision Tree

Text Books:

1. Bio Informatics and Molecular Evolution by Paul G. Higgs and Teresa K. Attwood
2. Bio Informatics Computing by Bryan Bergeron

Reference books:

1. Bio Informatics and Functional Geneomics, by Jonathan Pevsner
2. Gene Cloning DNA Analysis, by T.A. Brown

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BUSINESS ANALYTICS**
SUBJECT CODE	**:**	**IT802A**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8th Semester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:
Basic knowledge of Statistical Inference, Multiple Linear Regression and Probability Distributions. Proficiency in Algorithms and Computer Programming Skills.

Course Objective:
The objective of this course is to cover fundamental algorithms and techniques used in Business Analytics its applications along with the statistical foundations.

Course Outcome:
After completion of this course student will be able to

IT802A.1: Find a meaningful pattern in data

IT802A.2: Graphically interpret data

IT802A.3: Implement the analytic techniques

IT802A.4: Handle large scale analytics projects from various domains

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT802A.1	2	3	2	2	3				2			
IT802A.2	2	3	3	3	3							
IT802A.3	2	3	3	3	3				2			
IT802A.4	2	3	3	3	3				2	1		2

Course Content:

Module 1: [4L]
Foundations of Business Analytics: Introduction to Business Analytics, Analytics on Spreadsheets. Data Definitions and Analysis Techniques. Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing, Introduction to statistical learning and R-Programming

Module 2: [6L]
Product-Market Fit: Gap Analysis, Carrying Out Gap Analysis, Steps in Gap Analysis, Conducting a Representative Survey for Gap Analysis, Predicting Consumer Behaviour and Gap Analysis in Smartphone Market.

Module 3: [7L]
Analytical Modeling by Factor and Cluster Analysis, Factor Analysis Concepts, Application of Factor Analysis Concepts of Cluster Analysis, Similarity Measures, Application of Cluster Analysis.

Module 4: [10L]
Analytical Modeling by Logistics Regression and Discriminant Analysis: Linear Discriminant Analysis Model, Predictive Modeling using Discriminant Analysis, Application of Linear Discriminant Analysis for Credit Scoring of Loan Applicants. Theoretical Formulation of Logistics Regression, Mathematical Interpretation of Logistics Regression, Indicator for Model Fit, Applying Logistics Regression, Application of Logistics Regression in Predicting Risk in Portfolio Management Testing the Reliability/Consistency of the Different Factors Measured.
Module 5: [4L]
Segmentation of primary target market by Heuristic Modeling: Introduction to RFM Analysis, Enhancing Response Rates with RFM Analysis.

Module 6: [6L]
Segmentation of target market based on large databases using Decision Tree approach. Introduction to Chi-square Automatic Interaction Detection (CHAID), Predictive Modelling by CHAID.

Case Studies and Projects: [6L]
Understanding business scenarios, Feature engineering and visualization. Scalable and parallel computing with Hadoop and Map-Reduce, Sensitivity Analysis, Practice and analysis with R.

Text books:
1. Business Analytics: An Application Focus, Purba Halady Rao, Prentice Hall.
2. Business Analytics, James R. Evans, Pearson.

Reference books:
1. Modeling Techniques in Predictive Analytics, Thomas W. Miller, Pearson
2. Enterprise Analytics: Optimize Performance, Process, and Decisions Through Big Data, Thomas H. Davenport, Pearson.
3. Fundamentals of Business Analytics, Seema Acharya, Wiley India.
4. Business Intelligence: A Managerial Perspective on Analytics, Ramesh Sharda, Dursun Delen, Efraim Turban, David King, Prentice Hall

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : CYBER LAW AND SECURITYPOLICY
SUBJECT CODE : IT802B
YEAR : FORTH
SEMESTER : 8th Semester
CONTACT HOURS : 3L+1T
CREDITS : 4

Prerequisite:

Concepts of Computer Networking, Network Security

Course Objective:

The objective of the course is to explain critical information infrastructure related to cyber security, explain the legal and regulatory framework to enable a safe and vibrant cyberspace, analyze cyber security that promotes safe and appropriate use of cyberspace, describe national/international cyber security capabilities.

Course Outcome:
After completion of this course student will be able to

IIT802B.1: Understand the policy issues related to electronic filing of documents with the Government agencies and further to amend the Indian Penal Code, the Indian Evidence Act, 1872, the Bankers' Books Evidence Act, 1891 and the Reserve Bank of India Act, 1934 and for matters connected therewith or incidental thereto.

IIT802B.2: Analyze the effectiveness of the prevailing information security law practices.

IIT802B.3: Identify the importance of lawful recognition for transactions through electronic data interchange and other means of electronic communication, commonly referred to as electronic commerce or E-Commerce.

IIT802B.4: Comprehend the architecture that can cater to the needs of the social information security.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IIT802B.1	3	2	2	1		2		2				2
IIT802B.2	2	2	1	1		1		3				1
IIT802B.3	2	2	2	2		2		1				
IIT802B.4	3	2	2	2	1	3		3				2

Course Contents

Introduction of Cybercrime: [6L]
Definition cybercrime, Forgery, Hacking, Software Piracy, Computer Network intrusion, Category of Cybercrime, how criminals plan attacks, passive attack, Active attacks, cyber stalking. Overview of Indian Legal System, Introduction to IT Act 2000, Amendments in IT Act, Cyber Laws of EU, USA, Australia, Britain.

Computer Ethics, Privacy and Legislation: [6L]
Computer ethics, moral and legal issues, descriptive and normative claims, Professional Ethics, code of ethics and professional conduct. Privacy, Computers and privacy issue, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT, Legal Policies, legislative background.

Cybercrime Mobile & Wireless Devices: [3L]
Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cell phones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop.

Cybercrime Mobile & Wireless Devices: [6L]
Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/ cell phones, Theft, Virus, Hacking. Bluetooth, Different viruses on laptop.

Tools and Methods used in Cybercrime: [6L]
Proxy servers, password checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection, buffer over flow.

Intellectual Property Rights Issues: [8L]
Copyrights, Jurisdiction Issues and Copyright Infringement, Multimedia and Copyright issues, WIPO, Intellectual Property Rights, Understanding Patents, Understanding Trademarks, Trademarks in Internet, Domain name registration, Software Piracy, Legal Issues in Cyber Contracts, Authorship, Document Forgery.

Text Books:
1.Cyber security by Nina Gobole & SunitBelapune; Pub: Wiley India.
2. Textbook On Cyber Law by Pavan Duggal, Pub:Univarsal

Reference books:
1. Cyber Law and Cyber Crime simplified by Prashant Mali

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**ADVENCED DBMS**
SUBJECT CODE	:	**IT 802C**
YEAR	:	**FORTH**
SEMESTER	:	**8^{th} Semester**
CONTACT HOURS	:	**3L + 1T**
CREDITS	:	**4**

Prerequisite:
Database Management System, Operating System, Computer Networking

Course Objective:
The objective of the course is to present an introduction to different database management systems, with an emphasis on advanced transaction processing and recovery system.

Course Outcome
After completion of this course student will be able to
IT802C.1: Evaluate and Apply Advanced Database Development Techniques.
IT802C.2: Evaluate different Database Systems
IT802C.3: Perform administrator's job for database systems.
IT802C.4: Design & Implement Advanced Database Systems

CO-PO Mapping

Course Contents:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT802C.1	2	3	3	3					2			
IT802C.2	2	3	3	3								
IT802C.3	1	3	3	3					2			
IT802C.4	2	3	3	3					2	1		2

Database-System Architectures: [3L]
Centralized and client–server architectures, Server system architectures, Parallel systems, Distributed systems, Network types.

Parallel Databases: [4L]
Parallel databases, I/O parallelism, Inter query parallelism, Intra query parallelism, Intra operation parallelism, Interoperation parallelism, Design of parallel systems.

Distributed Databases: [8L]
Homogeneous and heterogeneous databases, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed databases, Directory systems.

Object-Based Databases: [4L]
Overview of object-based databases, Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multi set types in SQL, Introduction of object-identity and reference types in SQL, Object-oriented versus object-relational.

Advanced Application Development: [2L]
Performance tuning, Performance benchmarks, Standardization, Application migration.

Advanced Data Types & New Applications: [5L]
Motivation, Time in databases, Spatial and geographic data, Multimedia databases, Mobility and personal databases, Temporal database.

Advanced Transaction Processing : [6L]
Transaction-processing Monitors, Transactional workflows, E-Commerce, Main-memory databases, Real-time transaction systems, Long-duration transactions, Transaction management in multi-databases.

XML: [5L]
Motivation, Structure of XML data, XML document schema, Querying and transformation, Application program interfaces to XML, Storage of XML data, XML applications, UML.

Text Books:
1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.

Reference Books:
1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill.
2. Peter Rob and Carlos Coronel, Database Systesm- Design, Implementation and Management (7/e), Cengage Learning.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**INTERNET OF THINGS**
SUBJECT CODE	:	**IT802D**
YEAR	:	**FORTH**
SEMESTER	:	**8^{th} Semester**
CONTACT HOURS	:	**3L +1T**
CREDITS	:	**4**

Prerequisite:
Basic concepts of Operating System, Computer Networking, Web Applications, Cloud Computing.

Course Objective:
The objective of the course is to make students understand the concepts of Internet of Things (IoT) and can able to build IoT applications.

Course Outcome
After completion of this course student will be able to
IT802D.1: Understand the basic concepts of Internet of Things and its architecture.
IT802D.2: Analyze and understand the basic applications of IoT.
IT802D.3: Evaluate and analyze different solution for the real life problems of Internet of Things.
IT802D.4: Apply the concepts of IoT to design different tools.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IT802D.1	3	3	2	2								
IT802D.2	3	2	2	2								
IT802D.3	3	3	3	3	2							
IT802D.4	3	3	3	2	3	2	3		3		3	3

Course Content:

IoT-An Architectural Overview [12L]
Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.

IoT Architecture-State of the Art [12L]
Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Layers Architecture [12L]
PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer.

Text Books:

1. Internet of Things by Raj Kamal Mc Graw Hill
2. IOT fundamentals, David, Pearson Education.
3. Internet of Things by Tripathy and Anuradha, CRC Press.

Reference Books:

1. Getting Started With The Internet Of Things: Connecting Sensors and Microcontrollers to the Cloud Cuno Pfister O'Reilly
2. Internet Of Things, Bahga Orient Black Swan

STREAM : INFORMATION TECHNOLOGY
SUBJECT NAME : VALUES AND ETHICS IN PROFESSIONS
SUBJECT CODE : HU802
YEAR : FORTH
SEMESTER : 8^{th} Semester
CONTACT HOURS : 2L
CREDITS : 2

Prerequisite:
Basic knowledge of management, communication, environment science

Course Objective:
To create awareness on professional ethics and Human Values

Course Outcome:
After completion of this course student will be able to

HU802.1: Understand the core values that shape the ethical behaviour of an engineer and Exposed awareness on professional ethics and human values.
HU802.2: Understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
HU802.3: Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field
HU802.4: Aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
HU802.5: Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU802.1						1	1	1	1	2		
HU802.2						1	1	3	1	2		
HU802.3						3	2	3		1		
HU802.4						3	2	1				
HU802.5						3	2	2		1	3	

Course Contents:

Module 1: [3L]
Introduction: Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

Module 2: [5L]
Psycho-social theories of moral development: View of Kohlberg; Morality and Ideology, Culture and Morality, Morality in everyday Context.

Module 3: [5L]
Ethical Concerns: Work Ethics and Work Values, Business Ethics, Human values in organizations: Values Crisis in contemporary society Nature of values: Value Spectrum of a good life.

Module 4: [6L]
Ethics of Profession: Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Module 5 : [6L]
Self Development: Character strengths and virtues, Emotional Intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

Module 6 : [8L]
Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology, Movement of Schumacher; Problems of man, machine, interaction.

Text books:
1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994.
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

Reference books:
1. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

JIS COLLEGE OF ENGINEERING

(An Autonomous Institution)

COURSE STRUCTURE AND SYLLABUS

For

B.TECH.
In
Information Technology

Affiliated to West Bengal University of Technology

(Finalized on BOS Meeting dated 13.09.2014)

B. Tech in Information Technology

1st Year - Semester 1

(2013-2017, 2014-2018, and 2015-2019 Batch)

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
HU101	Professional Communication	2	0	0	2	30	70	100
M101	Mathematics-I	3	1	0	4	30	70	100
PH101	Physics –I	3	1	0	4	30	70	100
EE101	Basic Electrical Engineering	3	1	0	4	30	70	100
ME101	Engineering Mechanics	3	1	0	4	30	70	100
HU191	Language Lab	0	0	2	2	40	60	100
PH191	Physics Lab-I	0	0	3	2	40	60	100
EE191	Basic Electrical Engineering Lab	0	0	3	2	40	60	100
ME191	Engineering Workshop Practice	0	0	3	2	40	60	100
IT191	Computer Practice Lab	0	0	3	2	40	60	100
XC181	NCC/NSS	0	0	2	1	40	60	100
	Total	14	4	16	29	390	710	1100

L-Lecture T-Tutorial P- Practical IE- Internal Exam FE –Final Exam

B. Tech in Information Technology

1st Year - Semester 2

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
HU201	Values & Ethics on Profession	2	0	0	2	30	70	100
M201	Mathematics-II	3	1	0	4	30	70	100
CH201(IT)	Engineering Chemistry	3	1	0	4	30	70	100
EC201	Basic Electronics Engineering	3	1	0	4	30	70	100
IT201	Principle of Procedural Programming	3	1	0	3	30	70	100
CH291	Engineering Chemistry Lab	0	0	3	2	40	60	100
EC291	Basic Electronics Engineering Lab	0	0	3	2	40	60	100
IT291	Programming Lab	0	0	3	2	40	60	100
ME291	Engineering Graphics Lab	0	0	3	2	40	60	100
	Total	14	4	12	25	310	590	900

L-Lecture T-Tutorial P- Practical IE- Internal Exam FE –Final Exam

B. Tech in Information Technology

2nd Year - Semester 3

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
M301 (IT)	Mathematics-III (Discrete Mathematics and Graph theory)	3	1	0	4	30	70	100
PH301	Physics –II	3	1	0	4	30	70	100
IT301	Digital Electronics	3	1	0	4	30	70	100
IT302	Data Structures and Algorithms	3	1	0	4	30	70	100
IT303	Numerical Methods	3	1	0	3	30	70	100
PH391	Physics II Lab	0	0	3	2	40	60	100
IT391	Digital Electronics Lab	0	0	3	2	40	60	100
IT392	Data Structures and Algorithms Lab using C	0	0	3	2	40	60	100
IT393	Numerical Methods & Programming Lab	0	0	3	2	40	60	100
	Total	15	5	12	27	310	590	900

L-Lecture T-Tutorial P- Practical IE- Internal Exam FE –Final Exam

B. Tech in Information Technology

2nd Year - Semester 4

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
IT401	Computer Organization & Architecture	3	1	0	4	30	70	100
IT402	Operating System-I	3	1	0	4	30	70	100
IT403	Database Management System- I	3	1	0	4	30	70	100
IT404	Object Technology & UML	3	0	0	3	30	70	100
IT405	Formal Language and Automata Theory	3	1	0	3	30	70	100
IT491	Computer Organization & Architecture Lab	0	0	3	2	40	60	100
IT492	Operating System Lab	0	0	3	2	40	60	100
IT493	Database Management System- I Lab	0	0	3	2	40	60	100
IT494	Object Technology & UML Lab	0	0	3	2	40	60	100
IT495	Visual Programming Lab	0	0	3	2	40	60	100
HU481	Technical Report Writing & Language Laboratory	1	0	2	2	40	60	100
	Total	16	4	17	30	390	710	1100

L-Lecture T-Tutorial P- Practical IE- Internal Exam FE –Final Exam

B. Tech in Information Technology

3rd Year - Semester 5

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
IT501	Data Communication and Networking (Networking I)	3	1	0	4	30	70	100
IT502	Microprocessor & Microcontroller	3	1	0	4	30	70	100
IT503	Database Management System- II	3	1	0	4	30	70	100
IT504	Software Engineering & Project Management	3	0	0	3	30	70	100
IT505 (elective)	A. Artificial Intelligence B. Operation Research & Optimization Techniques C. Computer Graphics D. Object Oriented Programming with C++	3	1	0	4	30	70	100
IT591	Data Communication &Networking/Networking I Lab	0	0	3	2	40	60	100
IT592	Microprocessor & Microcontroller Lab	0	0	3	2	40	60	100
IT593	Database Management System- II Lab	0	0	3	2	40	60	100
IT 594	Software Engineering & Project Management Lab	0	0	3	2	40	60	100
IT595 (elective)	A. Artificial Intelligence Lab B. Operation Research & Optimization Techniques Lab C. Computer Graphics Lab D. Object Oriented Programming with C++ Lab	0	0	3	2	40	60	100
	Total	15	4	15	29	350	650	1000
MC581	Project and Technical Report Writing and Presentation on Industrial Training-I (2 weeks duration)	0	0	0	Mandatory course			
MC582	General Proficiency-I (General aptitude, Technical Communication & Soft Skill)	0	0	3	Mandatory course			
MC583	Professional Certification Program I	0	0	0	Mandatory course			

L-Lecture T-Tutorial P- Practical IE- Internal Exam FE –Final Exam

B. Tech in Information Technology

3rd Year - Semester 6

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
IT601	System Software & Network Administration (Networking II)	3	1	0	4	30	70	100
IT602	Web Technology(Advance Java & J2EE)	3	1	0	4	30	70	100
IT603	Soft Computing	3	0	0	3	30	70	100
IT604	Multimedia Technology	3	0	0	3	30	70	100
IT605 (elective)	A. Design Analysis of Algorithm B. Digital Image Processing C. Advanced Operating System	3	1	0	4	30	70	100
IT691	System Software & Network Administration Lab/Networking II Lab	0	0	3	2	40	60	100
IT692	Web Technology lab (Advance Java & J2EE Lab)	0	0	3	2	40	60	100
IT693	Soft Computing Lab	0	0	3	2	40	60	100
IT694	Multimedia Technology Lab	0	0	3	2	40	60	100
HU691	Foreign Language Lab(Japanese/French/German/Spanish)	0	0	3	2	40	60	100
	Total	15	3	15	28	350	650	1000
MC681	Project ,Technical Report Writing and Presentation on Industrial Training-II (2 weeks duration)	0	0	0	Mandatory course			
MC682	General Proficiency-II (General aptitude, Technical Communication & Soft Skill)	0	0	3	Mandatory course			
MC683	Professional Certification Program II	0	0	0	Mandatory course			

B. Tech in Information Technology

L-Lecture T-Tutorial P- Practical IE- Internal Exam FE –Final Exam

4th Year - Semester 7

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
IT701	E-Commerce & ERP	3	1	0	4	30	70	100
IT702	Mobile Communication	3	1	0	4	30	70	100
IT703 (elective)	A. Cloud Computing & SOA B. Pattern Recognition C. Compiler Design	3	0	0	3	30	70	100
IT704 (elective)	A. VLSI Design B. Computer Vision & Robotics C. Bioinformatics & DNA Computing	3	0	0	3	30	70	100
IT791	E-Commerce & ERP Lab	0	0	3	2	40	60	100
IT792	C# and .NET Framework Lab	0	0	3	2	40	60	100
IT781	Minor Project	0	0	3	4	40	60	100
IT782	Technical Report Writing and Presentation on Industrial Training-III (4 Weeks Duration)	0	0	0	2	0	50	50
HU783	General Proficiency-III (Group discussion ,Soft Skill & Personality Development)	0	0	3	2	0	50	50
	Total	12	2	15	26	240	560	800
MC783	Professional Certification Program III	0	0	0	MANDATORY COURSE			

B. Tech in Information Technology

L-Lecture T-Tutorial P- Practical IE- Internal Exam FE –Final Exam

4th Year - Semester 8

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
HU801	Industrial Management	3	1	0	2	30	70	100
IT801	Internetworking Technologies	3	1	0	3	30	70	100
IT802 (elective)	A. Data Mining and Warehousing B. Real Time and Embedded Systems C. Building Enterprise Applications	3	0	0	3	30	70	100
IT803 (elective)	A. Network Security & Cryptography B. Natural Language Processing C Remote Sensing and GIS	3	0	0	3	30	70	100
IT891	Software Testing Lab	0	0	3	2	40	60	100
IT892	Mobile Application Development Lab	0	0	3	2	40	60	100
IT881	Major Project	0	0	6	8	40	60	100
IT882	Grand Viva	0	0	0	2		100	100
MC881	General proficiency-IV (Practice Session for GRE,TOEFLE,CAT,MAT,GMAT etc.)	0	0	3	MANDATORY COURSE			
	Total	12	2	15	25	240	560	800

Total Course Credit: 219

L-Lecture T-Tutorial P- Practical IE- Internal Exam FE –Final Exam

Bachelor of Technology in Information Technology

1st Year - Semester 1

Paper code	Name of the subjects	Periods (WCH)			Credits	Total Credits	Marks		
		L	T	P			IE	FE	Total Marks
HU101	Professional Communication	2	0	0	2	20	30	70	100
M101	Mathematics-I	3	1	0	4	40	30	70	100
PH101	Physics –I	3	1	0	4	40	30	70	100
EE101	Basic Electrical Engineering	3	1	0	4	40	30	70	100
ME101	Engineering Mechanics	3	1	0	4	40	30	70	100
HU191	Language Lab	0	0	2	2	20	40	60	100
PH191	Physics Lab-I	0	0	3	2	20	40	60	100
EE191	Basic Electrical Engineering Lab	0	0	3	2	20	40	60	100
ME191	Engineering Workshop Practice	0	0	3	2	20	40	60	100
IT191	Computer Practice Lab	0	0	3	2	20	40	60	100
XC181	NCC/NSS	0	0	2	1	10	40	60	100
	Total	14	4	16	29	290	390	710	1100

B. Tech in Information Technology
1st Year - Semester 1

Paper Name: Professional Communication
Paper Code:HU101
Contacts:2L
Credit:2

Fundamentals of Technical Communication : process of communication, language as a tool of communication, levels of communication , flow of communication, barriers to communication, communication across cultures; Technical Communication: meaning, significance, characteristics, difference between technical and general communication.[4L]

Elements of Written Communication: words and phrases, word formation, synonyms and antonyms, homophones, one word substitution, sentence construction, paragraph construction,tense,preposition,voice change .[8L]

Forms of Technical Communication: business letters, job application letter and resume, business letters: sales & credit letters, letters of enquiry, letters of quotation, order, claim and adjustment letters, official letters: D.O. letters, government letters, letters to authorities, etc.

Technical Reports: general format of a report, formal and informal reports, memo report, progress report, status report, survey report, trip report, trouble report, laboratory report, research papers, dissertations and theses.

Technical Proposals: purpose, characteristics, types, structure. [8L]

Presentation Strategies: defining the subject, scope and purpose, analysing audience & locale, collecting materials, preparing outlines, organising the contents, visual aids, nuances of delivery, extemporaneous, manuscripts, impromptu, memorization and non- verbal strategies.[6L]

Value-based Text Reading: [4L]

(A) Study of the following essays from the text book with emphasis on writing skills:

1. The Thief by Ruskin Bond
2. The Open Window by Saki
3. Marriage is a private Affair by Chinua Achebe
4. The Moon in the Earthen Pot by Gopini Karunakar

Suggested Text / Reference Books:

1. Board of Editors: Contemporary Communicative English for Technical Communication, Pearson Longman,2010
2. Dr. D. Sudharani: Manual for English Language Laboratory Pearson Education (W.B. edition), 2010
3. Technical Communication Principles and Practice by Meenakshi Raman, Sangeeta Sharma(Oxford Higher Education)
4. Effective Technical Communication by Barun K.Mitra(Oxford Higher Education)
5. V. Sashikumar (ed.): Fantasy- A Collection of Short Stories Orient Black swan (Reprint 2006)

Paper Name: Mathematics-I
Paper Code: M101
Contacts:3L+1T
Credit:4

Matrix: Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, Adjoint of a determinant, Jacobi's theorem on adjoint determinant. Singular and non-singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, orthogonal matrix and its properties, Trace of a matrix.Rank of a matrix and its determination using elementary row and column operations.

Infinite Series: Preliminary idea of sequence, Infinite series and their convergences/divergences, Infinite series of positive terms, Tests for convergence: Comparison test, Cauchy's root test, D'Alembert's ratio test and Raabe's test. Alternating series, Leibnitz's test. Absolute convergence and Conditional convergence. Power series (Definition and Examples).

Calculus of functions of single variable: Successive differentiation : Higher order derivatives of a function single variable, Leibnitz's theorem(statements and its applications).Rolle's theorem and its applications. Mean value theorem- Lagrange & Cauchy and their application, Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Taylor's and Maclaurin's theorem(Statements only), Maclaurin's infinite series expansion of functions: sinx, cosx , e^x, log(1+x), $(a+x)^n$, n being an positive integer or a fraction (assuming that the remainder $R_n \to 0$ as $n \to \infty$ in each case). Reduction formulae both for indefinite and definite integrals of types

$$\int \sin^n x,\ \int \cos^n x,\ \int \sin^m x \cos^n x,\ \int \cos^m x \sin nx,\ \int \frac{dx}{\left(x^2+a^2\right)^n},\ m,n$$

are positive integers.

Calculus of functions of several variables: Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives and related problems, Homogeneous functions and Euler's theorem and related problems up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems, Concept of line integrals, Double and triple integrals.

Vector Calculus: Scalar and vector fields . Vector function of a scalar variable, Differentiation of a vector function, Gradient of a scalar point function, Directional derivative. Divergence and curl of a vector point function and related problems . Green's Theorem, Gauss Divergence Theorem and Stoke's Theorem (Statements and Applications).

Suggested Text / Reference Books:

1.Advanced Engineering Mathematics 8e by Erwin Kreyszig is published by Wiley India.
2.Engineering mathematics: B.S.Grewal (S.Chand &Co.).

3.higher Engineering Mathematics: John Bird (4th Edition, 1st India Reprint 2006,Elsevier.
4.mathematics Handbook : for Science and Engineering,L.Rade and B.Westergen(5PthP edition,1PstP Indian Edition 2009,Springer)
5.Calculus :M.J.Strauss,G.L.Bradly and K.L.Smith (3PrdP,1PstP Indian Edition 2007,Pearson Education)
6.Engineering mathematics: S.S.Sastry (PHI,4PthP Edition,2008)
7.Advanced Engineering Mathematics,3E:J.L.Goldberg and E.F.Abonfadel (OUP),Indian Edition.

Paper Name: Physics-I
Paper Code:PH101
Contacts:3L+1T
Credit:4
Module 1: Classical Mechanics

1.01: Classical Mechanics: Limitations of Newtonian Mechanics, constraint, degree of freedom, generalized coordinates, Lagrange's equation (No derivation), Hamilton's principle, Applications of Lagrange's equation: Linear Harmonic Oscillators-Differential equation and its solution, superposition of two linear SHM's (with same frequency), Lissajous' figures. 4L

1.02: Damped vibration: Introduction – differential equation and its solution, critical damping, Logarithmic decrement. 1L

1.03: Forced vibration: Introduction – differential equation, Amplitude and velocity resonance, Sharpness of resonance and Quality factor, Application to L-C-R Circuit 2L

1.04: Electromagnetic theory-I:

1.04-A: Vector operators, Gradient, Divergence, Curl-Physical significance, Gauss's divergence theorem (statement only), Stoke's theorem (statement only) and their applications. 2L

1.04-B: Development of electromagnetic theory, Electromagnetic spectrum, Concept of displacement current, equation of continuity, Maxwell's field equations with physical significance, wave equation in free space, transverse nature of electromagnetic wave, electromagnetic waves in a charge free conducting medium, skin depth, Poynting vector. 3L

Module 2: OPTICS 1:
2.01: Interference – Conditions for sustained interference, Young's double slit as an example . Qualitative idea of Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Fresnel's Biprism, thin films of uniform thickness (derivation) Newton's ring. 4L

2.02: Diffraction of light – Fresnel and Fraunhofer class. Fraunhofer diffraction for single slit and double slits (elementary treatment, Intensity distribution). Plane transmission grating (No deduction of the intensity distributions is necessary). Missing orders. Dispersive power, Rayleigh criterion (qualitative), Resolving power of grating (Definition and formulae). Use of grating as a monochromator. 3L

2.03: Polarization: General concept of Polarization, Plane of vibration and plane of polarization, Concept of Plane, Circularly and Elliptically polarized light (using wave equations), Polarization through reflection and Brewster's law, Double refraction (birefringence) -Ordinary and Extra-ordinary rays, Nicol's Prism. 3L

2.04: Laser : Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co-efficient (derivation of the mutual relation), concept of laser as a polarized source, Optical resonator and Condition necessary for active Laser action, Ruby Laser, He-Ne Laser, semiconductor Laser- applications of laser. 3L

2.05: Fiber optics: Optical Fibers – Core and cladding, total internal reflection step index and graded index fiber, Calculation of Numerical aperture and acceptance angle, losses in the fiber, applications. 2L

Module 3: Elementary solid state physics

3.00: Crystallography & Solid state physics: Space lattice, unit cell, crystal systems, Bravais lattices, basis, co-ordination number and atomic packing fraction, scc, bcc and fcc and hcp structures lattice planes, indexing of directions, Miller indices, interplaner spacing, Bragg's law & its application to real crystal structure (NaCl, KCl). 4L

Module 4: Quantum Mechanics I:

4.01: Matter waves: Concept of de Broglie's Matter waves, derivation of wavelength of matter waves in different forms, Concept of Phase velocity and Group velocity (qualitative) 2L

4.02: Wave mechanics: Concept and Physical significance of wave function Ψ and interpretation of

$|\Psi|^2$, Ψ(normalization and probability interpretation), Heisenberg's Uncertainty principle with illustration; Schrödinger's equation- time dependent and time independent form (derivation). Discussion with relevant problems. 3L

4.03: Operator algebra: Operator, Commutator, Formulation of quantum mechanics and Basic postulates, Operator correspondence, Expectation values, Ehrenfest theorem. Discussion with relevant problems. 4L

List of Assignments/Tests:

- **15 marks Internal test 1 & Internal test 2 (best of the two would be considered)**
- **Assignments in regular classes, tutorial classes and surprise tests.**

General idea about Measurements and Errors (Mandatory):

Measurand (objects to be measured) precision, significant number., accuracy, certainty, resolution; Errors - types and sources of errors (definitions and examples), Systematic error, Random error, Ambiguity error, Dynamic error, with example of Slide calipers, Screw-gauge, Carrey Foster bridge. Study of different types of unit cells with model system.

Experiments on Classical Mechanics:
1. Study of torsional oscillation of torsional pendulum & determination of time period using various load of the oscillator.
2. Experiments on Lissajous figure (using CRO).
3. Study of LCR circuit using ac signal and determination of Q factor.

Experiments on Optics:
4. Determination of wavelength of light by Newton's ring method.
5. Determination of wavelength of light by Fresnel's bi-prism method.
6. Determination of wavelength of light by Laser diffraction method.
7. Determination of numerical aperture and the energy losses related to optical fibre experiment
8. Study of Hydrogen/ Helium spectrum using transmission grating and measurement of Rydberg Constant.
9. Inspection of Laser beam profile-to find beam divergence.
10. Study of half-wave and quarter wave plates.
11. Measurement of specific rotation of an optically active solution by polarimeter

Experiments on electromagnetic theory:
12. Measurement of nodal and antinodal points along a transmission wire and measurement of wave length.

Experiments on Quantum Mechanics I
13. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
14. Measurement of Stopping potential using a photocell and determination of Planck's Constant.

Suggested Text / Reference Books:

Module 1: Experiments on Classical Mechanics:
1. Classical Mechanics- J. C. Upadhyay (Himalya Publishers)
2. Classical Mechanics-Shrivastav
3. Classical Mechanics-Takwal & Puranik (TMH)
4. Sound-N. K. Bajaj (TMH)
5. Advanced Acoustics-D. P. Roy Chowdhury (Chayan Publisher)
6. Principles of Acoustics-B.Ghosh (Sridhar Publisher)
7. A text book of sound-M. Ghosh (S. Chand publishers)
8. Electromagnetics-B.B. Laud (TMH)
9. Electricity Magnetism-B.Ghosh (Book & Allied Publisher)
10. Electricity Magnetism-Chattopadhyay & Rakshit (New Central Book Agency)
11. A text book of Light- K.G. Mazumder & B.Ghoshs, (Book & Allied Publisher)
12. Electricity Magnetism-Fewkes and Yardwood (Oxford University Press)

Module 2: OPTICS 1:
1. A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)
2. A text book of Light-Brijlal & Subhramanium, (S. Chand publishers)
3. Modern Optics-A. B. Gupta (Book & Allied Publisher)
4. Optics-Ajay Ghatak (TMH)
5. Optics-Hecht
6. Optics-R. Kar, Books Applied Publishers

Module 3: Elementary solid state physics

1. Solid state physics-Puri & Babbar (S. Chand publishers)
2. Materials Science & Engineering-Kakani Kakani
3. Solid state physics- S. O. Pillai
4. Introduction to solid state physics-Kittel (TMH)
5. Solid State Physics and Electronics-A. B. Gupta, Nurul Islam (Book & Allied Publisher)

Module 4: Quantum Mechanics I:

1. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
2. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
3. Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)
4. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)
5. Quantum Mechanics-Bransden (Pearson Education Ltd.)
6. Perspective of Modern Physics-A. Beiser (TMH)

General Reference:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
3. Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)
4. University Physics-Sears & Zemansky (Addison-Wesley)

PHYSCIS-I SYLLABUS (PROPOSED) AS PER MODULES & EXAM-GROUP* DIVISION

STREAM	MODULE-1	MODULE-2	MODULE-3	MODULE-4	GR-A *	GR-B*
1st year Basic Physics course	OPTICS 1: 4+3+3+3+2 =15L	Waves and Vibration, Electromagnetic theory-I: 2+2+3+5=12 L	Elementary solid state physics 4L	Quantum Mechanics I: 9L	1.01: Classical Mechanics (4L) 1.02: Damped vibration (1L) 1.03: Forced vibration (2L) 2.02:.Diffraction of light (3L) 2.05: Fiber optics (2L) 3.00 Elementary solid state physics. (4L) 4.03: Operator algebra (4L)	1.04 A & B: Electromagnetic theory-I (5L) 2.01: Interference (4L) 2.03: Polarization (3L) 2.04: Laser (3L) 4.01: Matter waves: (2L) 4.02: Wave mechanics (3L)

Paper Name: Basic Electrical Engineering
Paper Code: EE101

Contacts: 3L + 1T = 4
Credits: 4

DC Network Theorem:[7L] Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, Kirchhoff's law, Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, nodal analysis, mesh analysis, star-delta conversion. Maximum power transfer theorem with proof.

Electromagnetism:[5L] Biot-savart law, Ampere's circuital law, field calculation using Biot-savart & ampere's circuital law. Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faraday's law, Self and mutual inductance. Energy stored in a magnetic field, B-H curve, Hysteretic and Eddy current losses, Lifting power of Electromagnet.

AC fundamental:[] Production of alternating voltage, waveforms, average and RMS values, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, behaviour of AC series , parallel and series parallel circuits, Power factor, Power in AC circuit, Effect of frequency variation in RLC series and parallel circuits, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit.

Electrostatics:[5L] Coulomb's law, Electric Field Intensity, Electric field due to a group of charges, continuous charge distribution, Electric flux, Flux density, Electric potential, potential difference, Gauss's law, proof of gauss's law, its applications to electric field and potential calculation, Capacitor, capacitance of parallel plate capacitor, spherical capacitor, isolated spheres, concentric conductors, parallel conductors. Energy stored in a capacitor.

DC Machines:[6L] Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Speed-torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature-voltage and field control)

Single phase transformer:[4L] Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.

3 phase induction motor:[5L] Types, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, rating, torque-speed characteristics (qualitative only). Starter for squirrel cage and wound rotor induction motor. Brief introduction of speed control of 3 phase induction motor (voltage control, frequency control, resistance control)

Three phase system: [3L]Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method.

General structure of electrical power system:[1L] Power generation to distribution through overhead lines and under-ground cables with single lone diagram.

Suggested Text / Reference Books:

Text books:

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition 2005.
3. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
4. Basic Electrical Engineering, J.P. Tewari, New age international publication

Reference books:

1. Basic Electrical Engineering (TMH WBUT Series), Abhijit Chakrabarti & Sudipta Nath, TMH
2. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education, Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Basic Electrical Engineering, T.K. Nagsarkar & M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH
5. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

Paper Name: Engineering Mechanics
Paper Code:ME101
Contacts:3L+1T
Credit:4

Module 1:

Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector).

Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications.

Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces.

Module 2:

Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium.

Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction.

Module 3:

Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector,quadralateral, composite areas consisting of above figures.
Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone.
Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.
Module 4:
Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity;
Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs.
Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion).
Module 5:
Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy ; Principle of conservation of energy; Power and efficiency.

Books Recommended

1. Engineering Mechanics [Vol-I & II]by Meriam & Kraige, 5th ed. – Wiley India
2. Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI
3. Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. – TMH
4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P
5. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– Chhaya Prakashani
6. Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.
7. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – Pearson

Paper Name: Language Laboratory
Paper Code: HU191
Credit:2
Contacts:2

a) Honing 'Listening Skill' and its sub skills through Language Lab Audio device; 3P
b) Honing 'Speaking Skill' and its sub skills; 2P
c) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/Stress/ Intonation/ Pitch &Accent) of connected speech; 2P
j) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone , Mobile phone & Role Play Mode); 2P
k) Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success; 2P
f) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD; 4P

g) Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages; Learning Global / Contextual / Inferential Comprehension; 2P
h) Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions 2P
Total Practical Classes 17
Books Recommended:
Dr. D. Sudharani: Manual for English Language Laboratory Pearson Education (WB edition),2010
Board of Editors: Contemporary Communicative English for Technical Communication,Pearson Longman, 2010

Paper Name: Computer Practice Lab
Paper Code:IT191
Contact: 3P
Credits: 2

1.History of Computer, Generation of Computer, Classification of Computers
2.Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices
3.Different number systems and their conversions (Decimal, Binary, Octal , and Hexadecimal), binary Arithmetics
4. Logic gates : AND gate, OR gate, NOT.
5.Assembly language, High level language, Compiler, Assembler, Interpreter, Linker, Loader (basic concepts)
6.Networking Concepts, LAN, MAN, WAN, WWW, Internet and Email.
7.MS-OFFICE(MS-WORD,MS-EXCEL,MS-POWERPOINT
8.Design of Programming Logic:Algorithm and Flowchart, Construction of flowchart and algorithms
9.Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX, Basic organization of UNIX,Kernel
10.Basic DOS and UNIX commands

Paper Name: Engineering Workshop Practice(Gr-B / GrA)
Paper Code: ME191
Contact: 1L+3P= 4
Credits: 2

A. THEORETICAL PART

1. INTRODUCTION TO MANUFACTURING; Socio-economic role, Definition, Major grouping and Examples. - 1L
2. ENGINEERING MATERIALS; Classification / Major grouping, Physical, Chemical and Mechanical properties, Applications - 1L
3. DIFFERENT CONVENTIONAL MANUFACTURING PROCESSES MAINLY COVERING BASIC PRINCIPLES, DIFFERENT METHODS AND GENERAL APPLICATIONS; Manufacturing by forming /shaping from solid (input) to solid (product); Forging, Rolling, Drawing, Extrusion; Press tool work-Bending, Shearing, Drawing and Coining. - 3L
4. FORMING / SHAPING FROM LIQUID TO SOLID- CASTING; General principles, General

classification or Types of casting; Sand mould casting- procedural steps and requirements; Pattern, Mould, Melting, Pouring, Solidification, Extracting and Fettling. Other casting processes (for larger volume and quality); Centrifugal casting, Investment casting, Die casting. -3L

5. JOINING PROCESSES; Welding (Permanent Joining)- General classification and basis; Gas welding, Arc welding, Friction welding and Resistance welding, w.r.t. Principle, Requirements, Relative Advantages and Applications; Brazing and soldering.
- 2L

6. REMOVAL (MACHINING) PROCESS; Principle and purpose of machining, Machining requirements, Machine tools- Definition, General classification w.r.t, functional principles and applications; Major machining parameters (and responses)- Speed, Feed and Depth of cut; Tool geometry (Rake, Clearance and Cutting angles), Cutting fluid application; Elementary machining operations- Facing, Centering, Turning, Threading, Drilling, Boring, Shaping and Milling.
-2L

B. SCHEDULE OF PRACTICAL CLASSES

Suggested apportionment / weigtage:

• Machining (and fitting)- 50% (6 days) 18 hrs
• Casting (including pattern making molding and preparation) - 25% (3 days 9hrs)
• Welding (gas, arc and resistance) (2 days 6hrs) and Sheet Metal Working (1 day 3hr)- 25% (3 days 9hrs)

FEASIBLE TYPES / MODELS OF ASSIGNMENTS

i) FITTING (in 2 days or 6 hours); Making a gauge from MS plate as shown in Fig.1.

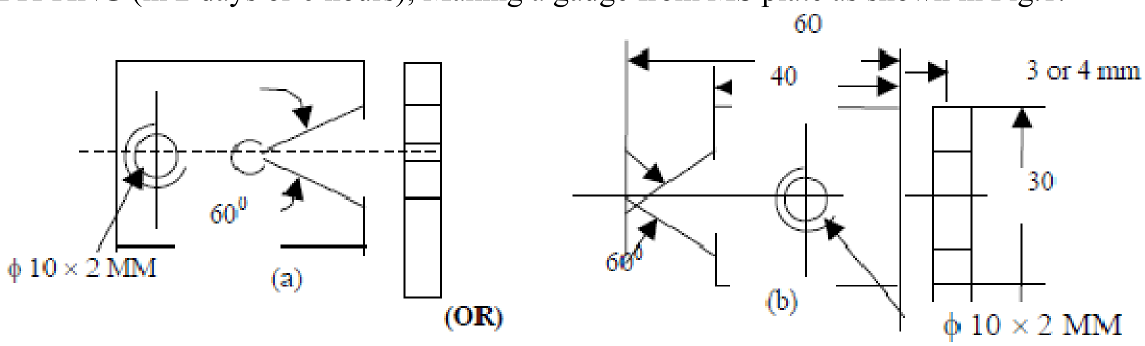


Fig.1: Job for fitting practice

Operations required:

11. Squaring and finishing of the blank by filing
12. Making the Vee-portion by sawing and filing
13. Drilling (in machine) and tapping (hand)

ii) MACHINING (in 3 days or 9 hours); To make a pin as shown in Fig.2 from a 20mm mild steel rod in a lathe.

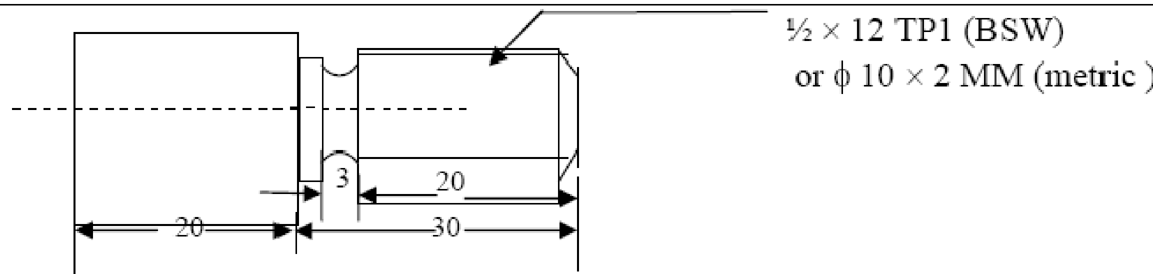
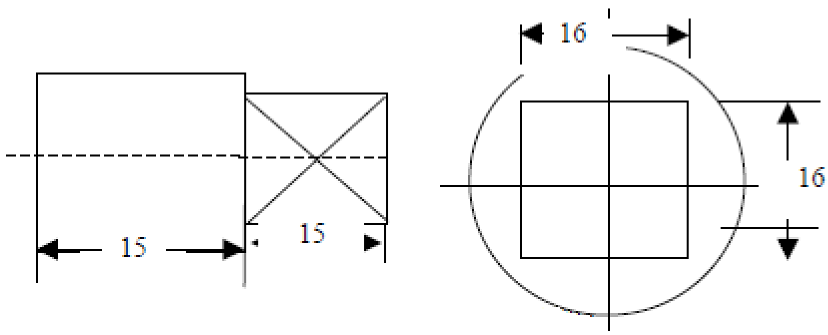


Fig.2: Job for practice on a lathe

iii) MACHINING (in 1 day or 3 hours); To make a MS prism as shown in Fig.3 from a 20mm mild steel rod in a shaping and / or milling machine.



iv) PATTERN MAKING, SAND MOULDING AND CASTING (in 3 classes or 9 hours); To make a wooden pattern and a sand mould with that pattern for casting a cast iron block as shown in Fig.4.

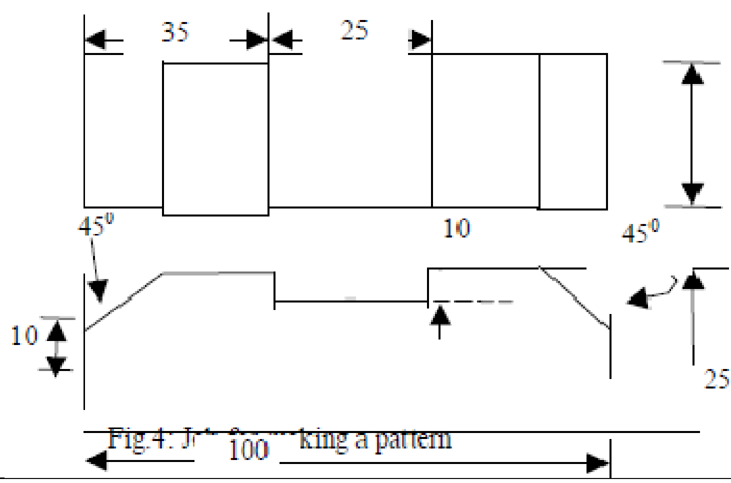


Fig.4: J... king a pattern

v) WELDING (GAS WELDING) (in 1 class or 3 hours); To join two thin mild steel plates or sheets (1 to 3 mm thick) as shown in Fig. 5 by gas welding.

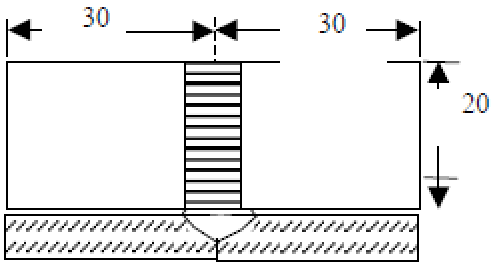


Fig.5: Welding specimen for practice
vi) WELDING (ARC WELDING) (in 1 day or 3 hours); To join two thick (6mm) MS plate as shown in Fig. 5 by arc welding.
vii) SHEET METAL WORK (in 1 day or 3 hours); Forming a cone, for example.

Paper Name: Physics Lab-I
Paper Code: PH191
Contacts:3P
Credit:2

General idea about Measurements and Errors (Mandatory):
Measurand (objects to be measured), precision, accuracy, certainty, resolution; Errors - types and sources of errors (definitions and examples), Systematic error, Random error, Ambiguity error, Dynamic error, with example of Slide calipers, Screw-gauge, Carrey Foster bridge. Study of different types of unit cells with model system.

Any 7 to be performed from the following experiments
Experiments on Classical Mechanics:
1. Study of torsional oscillation of torsional pendulum & determination of time period using various load of the oscillator.
2. Experiments on Lissajous figure (using CRO).
3. Experiments on LCR circuit.

Experiments on Optics:
4. Determination of wavelength of light by Newton's ring method.
5. Determination of wavelength of light by Fresnel's bi-prism method.
6. Determination of wavelength of light by Laser diffraction method.
7. Determination of numerical aperture and the energy losses related to optical fibre experiment

8. Study of Hydrogen/ Helium spectrum using transmission grating and measurement of Rydberg Constant.
9. Inspection of Laser beam profile-to find beam divergence.
10. Study of half-wave and quarter wave plates.

Experiments on electromagnetic theory:
11. Measurement of nodal and antinodal points along a transmission wire and measurement of wave length.
Experiments on Quantum Mechanics I
12. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
13. Measurement of Stopping potential using a photocell and determination of Planck's Constant.

Paper Name: Basic Electrical Engineering Lab
Paper Code:EE191
Contacts:3P
Credit:2

List of Experiments:
Sl. No Name of the Experiments
1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
(b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit
8. Calibration of ammeter and voltmeter.
9. Open circuit and Short circuit test of a single phase Transformer.
10. No load characteristics of D.C shunt Generators
11. Starting and reversing of speed of a D.C. shunt
12. Speed control of DC shunt motor.
13. Measurement of power in a three phase circuit by two wattmeter method.

Bachelor of Technology in Information Technology

1st Year - Semester 2

Paper code	Name of the subjects	Periods			Credits	Total Credits	Marks		
		L	T	P			IE	FE	Total Marks
HU201	Values & Ethics on Profession	2	0	0	2	20	30	70	100
M201	Mathematics-II	3	1	0	4	40	30	70	100
CH201	Engineering Chemistry	3	1	0	4	40	30	70	100
EC201	Basic Electronics Engineering	3	1	0	4	40	30	70	100
IT201	Principle of Procedural Programming	3	1	0	3	30	30	70	100
CH291	Engineering Chemistry Lab	0	0	3	2	20	40	60	100
EC291	Basic Electronics Engineering Lab	0	0	3	2	20	40	60	100
IT291	Programming Lab	0	0	3	2	20	40	60	100
ME291	Engineering Graphics Lab	0	0	3	2	20	40	60	100
	Total	14	4	12	25	250	310	590	900

Paper Name: Values & Ethics on Profession
Paper Code: HU201
Contact: 2L
Credits: 2

Group-A

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development

Energy Crisis: Renewable Energy Resources

Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics

Appropriate Technology Movement of Schumacher; later developments Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.

Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Group-B

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society

Nature of values: Value Spectrum of a good life

Psychological values: Integrated personality; mental health

Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity

Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Suggested Text / Reference Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

Paper Name: Mathematics-II
Paper Code: M201
Contact: 3L+1T
Credits: 4

Module I

Ordinary differential equations (ODE)- First order and first degree Exact equations,Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation).

Module II

ODE- Higher order and first degree :General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Eulerequations, Solution of simultaneous linear differential equations.

Module III

Basics of Graph Theory:Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph,; Walks, Paths, Circuits, Euler Graph, Cut sets and cut vertices, Matrix representation ofa graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite grap

Module IV

Tree: Definition and properties, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using Kruskal's and Prim's algorithm.

Module V

Improper Integral:Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. Problems related to Beta and Gamma functions.

Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of ( )f tt, LT of ( )nt f t, LT of derivatives of ( )f t, L.T. of ( )f u du∫. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT:Definition and its properties; Convolution Theorem(statement only) and its application to the evaluation of inverse LT, Solution of linearODE with constant coefficients (initial value problem) using LT. Z transform.

Suggested Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, (Wiley Eastern)
2. Graph Theory: V. K. Balakrishnan, (Schaum's Outline, TMH)
3. A first course at Graph Theory: J. Clark and D. A. Holton (Allied Publishers LTD)
4. Introduction to Graph Theory: D. B. West (Prentice-Hall of India)
5. Graph Theory: N. Deo (Prentice-Hall of India)
6. Engineering Mathematics:B.S. Grewal (S. Chand & Co.)

7. Higher Engineering Mathematics: John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
8. Calculus: Strauss, Bradley and Smith (3PrdPedition, Pearson Education)
9. Engineering Mathematics (Volume 2): S. S. Sastry (Prentice-Hall of India)
10. Advanced Engineering Mathematics, 3E: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OU P), Indian Edition
11. An Introduction to Differential Equations, R.K. Ghosh and K.C.Maity (New Central Book Agency)

Paper Name: Engineering Chemistry
Paper Code:CH201 (IT&CSE)
Contacts: 3L + 1T = 4
Credits: 4
Module 1

Chemical Thermodynamics:
Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.
Introduction to first law of thermodynamics: different statements, mathematical form.
Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.
Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. 3L
Heat Capacity: Definition, Classification of Heat Capacity (Cp and CV): Definition and General expression of Cp - CV. Expression of Cp - CV for ideal gas.
Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas,
Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process.
Application of first law of thermodynamics to chemical processes: exothermic, endothermic rocesses, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchoff's law. 3L
2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature. 2L
Evaluation of entropy: characteristics and expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. 2L
Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation. Condition of spontaneity and equilibrium reaction. 2L
Module 2
Electrochemistry:
Conductance Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions. Conductometric

titrations: SA vs SB & SA vs WB; precipitation titration KCl vs $AgNO_3$. 2L

Electrochemical cell:

Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, quinhydrone half cell and calomel half cell, Glass electrode (construction, representation, cell reaction, expression of potential, Discussion, Application)

Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application). 5L

Module 3

Solid:

Chemical bonding and states of matter Hydrogen bond, metallic bond and their applications. 2L

Solid state Chemistry Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency).

Conduction in Metal, Semiconductor-n type and p type, Effect of temperature on conductivity , p-n junction, rectifiers, transistors.

Photovoltaic cell, Fabrication of integrated circuits.

Role of silicon and germanium in the field of semiconductor. 4L

Module 4

Polymers and Nanomaterials

Introduction, classification, Hydrocarbon Molecules, Thermoplastic, Thermosetting Polymers. Basic Concepts Molecular Weight, Polymer Crystallinity. Crystallization, Melting and glass transition phenomena, Polymerization: addition, condensation, Copolymerization, Degree of polymerization, PDI. 3L

Electronic polymers-synthesis, properties, application. 2L

Preparation, properties, engineering applications of: polyethylene, PVC, Bakelite, nylon, natural rubber, vulcanization. elastomers – Buna-s, 2L

Introduction to Nanomaterials- Basic principle of nanoscience and technology, creation and use of buckyballs, structure, properties and uses of Carbon nanotubes, Applications of nanotechnology. 3L

Module 5

Industrial Chemistry

Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Coal analysis: Proximate and ultimate analysis.

Liquid fuel: Petroleum, classification of petroleum, Refining, Petroleum distillation, Thermal cracking, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Bio-diesel.

Gaseous fuels: Natural gas, water gas, Coal gas, bio gas. 5L

Suggested Text / Reference Books:

1. Sashi Chawla, A Text Book of Engineering Chemistry, Dhanpat Rai & Co.Pvt. Ltd.
2. Engineering Chemistry, P. C. Jain, Dhanpat Rai Publication

3. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).
4. P. Ghosh, Polymer Science and Technology of Plastics and Rubbers, Tata McGraw Hill Publishing Company Limited.
5. F.W.Billmeyer : Textbook of Polymer Science is published by Wiley India (is now an Indian Imprint.)
6. Joel R. Fried, Polymer Science and Technology, Pearson Education (2nd Edition).
7. I. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc.
8. Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.
9. Organic Chemistry, Mark Loudon, 4th Edition, Oxford Publishers..
10. Concise Inorganic Chemistry, J. D. Lee, Black Well Science

Paper Name: Basic Electronics Engineering
Paper Name:EC201
Contacts: 3L + 1T = 4
Credit:4

Module-I

Semiconductors: Conductors, Semiconductors and Insulators, electrical properties, band diagrams. Intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Diodes and Diode Circuits Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Module-II

Bipolar Junction Transistors: Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action and current amplification factors for CB and CE modes. Biasing and Bias stability.

Module-III

Field Effect Transistors: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles.

Module-IV

Feed Back Amplifier (basic concept), Oscillators and Operational Amplifiers: Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth

stability; effect of positive feedback, instability and oscillation, condition of oscillation, Barkhausen criteria.
Introduction to integrated circuits: Introduction to binary number; Basic Boolean algebra; Logic gates and function realization.

Suggested Text / Reference Books:

1. Millman & Halkias: Integrated Electronics.
2. Sedra & Smith: Microelectronics Engineering.
3. Malvino: Electronic Principle.
4. Schilling & Belove: Electronics Circuits.
5. Millman & Grabal: Microelectronics.
6. Salivahanan: Electronics Devices & Circuits.
7. Boyelstad & Nashelsky: Electronic Devices & Circuit Theory.

Paper Name: Principle of Procedural Programming
Paper Code: IT201
Contacts: 3L+1T
Credit: 3

Fundamentals of Computer:
History of Computer, Generation of Computer, Classification of Computers ,Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices ,Binary & Allied number systems ,representation of signed and unsigned numbers. Basic concepts of Assembly language, high level language, compiler and assembler , Basic concepts of operating system, Concept of Algorithm & flow chart

C Fundamentals:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements

Operators & Expressions:
Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Input and Output: Standard input and output, formatted output -- printf, formatted input scanf.

Flow of Control:
Statement and blocks, if - else, switch, loops - while, for do while, break and continue, go to and labels

Fundamentals and Program Structures:
Basic of functions, function types, functions returning values, functions not returning values, auto, external, static and register variables, scope rules, recursion, function prototypes, C preprocessor, command line arguments.

Arrays and Pointers:
One dimensional arrays, pointers and functions, multidimensional arrays.

Structures Union and Files:
Basic of structures, structures and functions, arrays of structures, bit fields, formatted and unformatted

files

Text Book:

1. Introduction To Computing (TMH WBUT Series), E. Balagurusamy,TMH
2. Gottfried Programming with C Schaum
3. Kerninghan B.W. & Ritchie D.M. The C Programming Language
4. Sinha & Sinha Fundamental of Computers
5. Kanetkar Y. Let us C

Reference Books:

1. Rajaram Computer Concepts & C Program, Scitech

2. Rajaraman V. Fundamental of Computers

Paper Name: Programming Lab
Paper Code:IT291
Contacts:3P
Credit:2

Exercises should include but not limited to:
1. Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not,
2.evaluate summation series, factorial of a number , generate Pascal's triangle,
find roots of a quadratic equation
3.. Programs to demonstrate control structure : text processing, use of break and continue, etc.
4. Programs involving functions and recursion
5. Programs involving the use of arrays with subscripts and pointers
6. Programs using structures and files.

Paper Name: Engineering Graphics Lab
Paper Code:ME291
Contacts: 1L+3P
Credits: 3

A. THEORETICAL PART
1. Introduction to Lines, Lettering, Dimensioning, Scales. - 1L
2. Geometrical Construction and Curves - 1L
3. Projection of Points, Lines and Surfaces - 2L
4. Projection of Solids - 2L
5. Isometric Views - 1L
6. Sectional Views - 1L
7. Development of Surfaces - 1L
8. Introduction to Computer Aided Drafting - 3L

B. PRACTICAL PART
1. LINES, LETTERING, DIMENSIONING, SCALES; Plain scale, Diagonal scale.- 6hrs
2. GEOMETRICAL CONSTRUCTION AND CURVES; Construction of polygons, Parabola, Hyperbola, Ellipse. - 6hrs
3. PROJECTION OF POINTS, LINES, SURFACES; Orthographic projection- 1st and 3rd angle projection, Projection of lines and surfaces– Hexagon. - 3hrs
4. PROJECTION OF SOLIDS; Cube, Pyramid, Prism, Cylinder, Cone. - 6hrs
5. DRAWING ISOMETRIC VIEW FROM ORTHOGONAL/ SECTIONAL VIEWS OF SIMPLE SOLID OBJECTS. - 3hrs
6. FULL AND HALF SECTIONAL VIEWS OF SOLIDS. - 3hrs
7. DEVELOPMENT OF SURFACES; Prism, Cylinder, Cone. - 3hrs
8. COMPUTER AIDED DRAFTING (Using AutoCAD and/or similar softwares); Introduction: Cartesian and Polar coordinate system, Absolute and Relative coordinates; Basic editing commands: Line, Point, Trace, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline; Editing methods; Basic object selection methods, Window and crossing window, Erase, Move, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror; Display commands: Zoom, Pan, Redraw, Regenerate; Simple dimensioning and text, Simple exercises. - 6hrs

Suggested Text / Reference Books:

1. Narayana, K.L. and Kannaiah, P. Text Book of Engineering Drawing“Engineering Graphics”, Scitech Publication
2. Bhatt, N.D. “Elementary Engineering Drawing”, Charotar Book Stall, Anand, 1998
3. Lakshminarayanan, V. and Vaish Wanar, R.S., “Engineering Graphics”, Jain Brothers, New Delhi, 1998
4. Chandra, A.M. and Chandra Satish, “Engineering Graphics”, Narosa, 1998
5. Jolhe, “Engineering Graphics”, Tata McGraw-Hill- WBUT Series
6. Gill, P.S., “A Text Book of Engineering Drawing”, Katson Publishing House (Kataria and Sons)
7. Venugopal, K., “Engineering Drawing & Graphics + AutoCAD”, New Age International
8. Ventaka Reddy K., “Text Book of Engineering Drawing (2nd Edition)”, BS Publication.

Paper Name: Engineering Chemistry Lab
Paper Code: CH 291(IT&CSE)
Contact: 3P
Credits: 2

Any six experiments
1. To Determine the alkalinity in a given water sample.
2. Red-ox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. To determine the value of the rate constant for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and

water)
6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
9. Determination of dissolved oxygen present in a given water sample.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)

Paper Name: Basic Electronics Engineering Lab
Paper Code: EC291
Contact: 3P
Credits: 2

Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT, FET) and electronic equipment like DC power supplies, multi-meters etc.
Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
Study of I-V characteristics of Junction diodes.
Study of I-V characteristics of Zener diodes.
Study of Half and Full wave rectifiers with Regulation and Ripple factors.
Study of I-V characteristics of BJTs (CE, CB).
Study of I-V characteristics of FETs (CS, CD).

Bachelor of Technology in Information Technology

2nd Year - Semester 3

Paper code	Name of the subjects	Periods			Credits	Total Credits	Marks		
		L	T	P			IE	FE	Total Marks
M301	Mathematics-III (Discrete Mathematics and Graph theory)	3	1	0	4	40	30	70	100
PH301 (IT)	Physics –II	3	1	0	4	40	30	70	100
IT301 (EC)	Digital Electronics	3	1	0	4	40	30	70	100
IT302	Data Structures and Algorithms	3	1	0	4	40	30	70	100
IT303	Numerical Methods	3	1	0	3	30	30	70	100
PH391	Physics II Lab	0	0	3	2	20	40	60	100
IT391 (EC)	Digital Electronics Lab	0	0	3	2	20	40	60	100
IT392	Data Structures and Algorithms Lab using C	0	0	3	2	20	40	60	100
IT393	Numerical Methods & Programming Lab	0	0	3	2	20	40	60	100
	Total	15	5	12	27	270	310	590	900

Bachelor of Technology in Information Technology

2nd Year - Semester 3

Paper Name: Mathematics-III (Discrete Mathematics and Graph theory)
Paper Code: M301
Contacts:3L+1T
Credits:4

Module I:
Introduction to Propositional Calculus: Propositions, Logical Connectives, Conjunction, Disjunction, Negation and their truth table. Conditional Connectives, Implication, Converse, Contrapositive, Inverse, Biconditional statements with truth table, Logical Equivalence, Tautology, Normal forms-CNF, DNF and related examples.
Module II:
Order, Relation and Lattices: POSET, Hasse Diagram, Minimal , Maximal, Greatest and Least elements in a POSET, Lattices and its properties, Principle of Duality, Distributive and Complemented Lattices. 10L
Module III:
Counting Techniques: Permutations, Combinations, Binomial coefficients, Pigeon- hole Principle, Principles of inclusion and exclusions;
Module IV
Recurrence relations: Formulation/Modelling of different counting problems in terms of recurrence relations, Solution of linear recurrence relations with constant coefficients (upto second order) by (i) The iterative method (ii) Characteristic roots method (iii) Generating functions method.
Module V:
Graph Coloring: Chromatic Numbers and its bounds, Independence and Clique Numbers, Perfect Graphs-Definition and examples, Chromatic polynomial and its determination, Applications of Graph Coloring.
Matchings: Definitions and Examples of Perfect Matching, Maximal and Maximum Matching, Hall's Marriage Theorem (Statement only) and related problems.

Suggested Text / Reference Books:

Texts:

1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH

References:
1. J.K. Sharma, Discrete Mathematics, Macmillan
2. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
3. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
4. Douglas B. West, Introduction to graph Theory, PHI

Paper Name: PHYSICS-II
Paper Code: PH(IT) 301
Contacts:3L+1T
Credits:4

Module 1: Quantum Mechanics-II, Quantum Computation and Communication

1.01: Vector space & Heisenberg representation: Elements of linear vector spaces- The idea of n- dimensional vector space, use of 'bra-ket' notation, linear independence, basis, inner product, norm of a vector; Hilbert space, Ortho normality; Matrix representation of bra & kets; linear operators; Pauli matrices; Definitions of Hermitian, Inverse and Unitary operators; Commutators; Tensor products. 4L

1.02: Quantum Computation & Communication: Idea of 'qubit' and examples of single qubit logic gates- Classical bits, Qubit as a two level system; Bloch vector representation of state of qubit; Polarization states of photon and measurements; Pauli gates, Phase shift gate, Quantum gates as rotations in Bloch sphere; concept of entanglement. Bell's inequality- the paradox, joint state of entangled particles; Two-qubit controlled gates; entanglement generation Quantum circuit for transforming computational basis to Bell basis; Quantum Teleportation (Basic idea) 6L

Module 2: PHYSICS OF SEMICONDUCTORS & ENERGY BAND THEORY

2.01: Applications of Schrödinger's equation – Finite Potential Barrier, WKB approximation (qualitative) -connection with semiconductor diode- tunneling effect. 3L

2.02: Free electron theory- Free electron theory-Drude model (qualitative), Ohm's law, Wideman Franz law, Electron scattering and resistance, relaxation time, diffusion length, mean free path. 2L

2.03: Band Theory: Introduction to Band theory (mention qualitatively improvement over free electron theory)- Kronig-Penny model (Use Schrödinger picture to obtain Energy-band (E-k) diagram), formation of allowed and forbidden energy bands, Concept of effective mass – electrons and holes, crystal momentum, Density of states (qualitative), Energy bands of metal, insulator, semiconductor, magneto-resistance, magnetostriction, Piezoelectric effect, Hall effect-applications. 3L

2.04 : Semiconductors and insulators: Direct & indirect band gaps, Fermi-Dirac distribution function (temperature dependence-qualitative discussions). Fermi level for intrinsic and extrinsic semiconductors (dependence on temperature and doping concentration viz. p type, n-type), Diffusion and drift current (qualitative). Generation and re-combination, quasi-Fermi energy level (basic concepts) band diagram of p-n, Schotkey diode, BJT and MOS-capacitors-principle of operation, Flat band and threshold voltages. 5L

Module 3: SOLID STATE ELECTRONIC & OPTO ELECTRONIC DEVICES

3.01: SOLID STATE ELECTRONICS DEVICES: Classification of different types of diode on the basis of doping concentration: rectifier diode (qualitative idea), Zener diode (qualitative idea), tunnel diode, IMPATT diode (importance of negative resistance), PNPN transistors - simple working principle, I-V characteristics, triggering-operating principle & application. 3L

3.02: Field effect transistors: Basic principles of p and n channel MOSFETS, CMOS, NMOS and VLSI MOSFETS-applications. 2L

3.03 Sensor & Detectors: Semiconductor sensors and detectors-applications-Charge Coupled device (CCD). 1L

3.04: OPTO ELECTRONIC DEVICES: Basic background of photonic devices, Photoconductivity, Optical devices, Importance of reverse current in optical detectors, photo-diodes, photo voltaic effects (solar cells), Light Emitting Diode (as direct band gap material), avalanche and photodiode,
Photo-transistors (Basic idea & application), LDR-operation & applications. 3L

Module 4: Storage & Display devices:

4.01: Storage devices: Magnetic field and Magnetization; Magnetic susceptibility, Paramagnetism, Concept of magnetic moment, Bohr Magneton, Curie's Law; Ferromagnetism, phenomenon of hysteresis-hysteresis loss, Hard ferromagnets, applications of permanent magnets; Comparison and applications of Soft ferromagnets (Permalloys, Ferrites). Magnetic resonance, NMR and MRI (qualitative discussions related to applications). 4L

4.02: Different Magnetic storage devices-Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Optical storage-CD, DVD, Blu-ray Disc. 2L

4.03: Display devices:

Operation and application of CRT, Liquid crystal display (LCD, LED, Plasma display, Thin film transistor display). 2L

List of Assignments/Tests:

- **15 marks Internal test 1 & Internal test 2 (best of the two would be considered)**
- **Assignments in regular classes, tutorial classes, surprise tests or through Problem oriented guided inquiry learning (POGIL)**

Suggested Text / Reference Books:

Module 1: Quantum Mechanics-II, Quantum Computation and Communication

1. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
2. Quantum Mechanics-Schiff (Addison-Wesley)
3. Quantum Computation and Quantum Information(10th Anniversary Edition)-Nielsen & Chuang (Cambridge University Press)
4. The physics of quantum information-Dirk Bouwmeester, Artur K. Ekert, Anton Zeilinger (Springer)
5. Quantum Mechanics-Cohen Tanuje.

Module 2: PHYSICS OF SEMICONDUCTORS & ENERGY BAND THEORY

1. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
2. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
3. Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)
3. Solid state physics- S. O. Pillai
4. Introduction to solid state physics-Kittel (TMH)
5. Solid State Physics- Ali Omar (Pearson Eduction)
6. Integrated Electronics-Millman Halkias (TMH)
7. Solid State Physics-A. J. Dekker (Prentice-Hall India)

Module 3: SOLID STATE ELECTRONIC & OPTO ELECTRONIC DEVICES

1. Solid state electronics-S. M. Zee & Sanjoy Banerjee
2. Optoelectronic devices-Pallab Bhattacharjee

Module 4: Storage devices & Applications
1 Introduction to solid state physics-Kittel (TMH)
2. Solid State Physics- Ali Omar (Pearson Eduction)
3. Solid state physics- S. O. Pillai
4. Solid State Physics-A. J. Dekker (Prentice-Hall India)
5. Materials Science-Raghavan

PHYSCIS-II SYLLABUS, Paper Code: PH 301 (IT) (PROPOSED) AS PER MODULES & EXAM-GROUP* DIVISION

STREAM	MODULE-1	MODULE-2	MODULE-3	MODULE-4	GR-A *	GR-B*
IT	Quantum Mechanics-II, Quantum Computation and Communication 4+6=10L	PHYSICS OF SEMICONDUCTORS & ENERGY BAND THEORY 2+2+4+3=11L	SOLID STATE ELECTRONIC & OPTO ELECTRONIC DEVICES 3+4+4=11 L	Storage & Display devices 8L	1.01: Vector space & Heisenberg representation (4L) 2.01: Applications of Schrödinger's equation (2L) 2.02: Free electron theory (2L) 2.03: Energy Band Theory (4L) 3.01: SOLID STATE ELECTRONICS DEVICES (3L) 4.01: Storage devices. (5L)	1.01: Quantum Computation & Communication (6L) 2.04 : Semiconductors and insulators (3L) 3.02: Field effect transistors (4L) 3.03: OPTO ELECTRONIC DEVICES (4L) 4.02: Display devices (3L)

Paper Name: Digital Electronics
Paper Code: IT301(EC)
Contacts:3L+1T

Credits:4

Number systems and arithmetic (Fixed and floating point), Combinational logic analysis and design: logic minimisation methods, Combinational logic circuits: adder, subtractor, multiplexer, demultiplexer, encoder, decoder, comparator; Logic families (TTL, ECL, CMOS, BICMOS), Delay, Hazards. Sequential logic design: latches and flip-flops (SR,D,JK,T), Setup and Hold time , Clock frequency, Finite state machine design, ASM charts, state minimization, state assignment, synthesis using D-FF and JK-FF, counters, shift registers, MSI devices as state machines, Memory cells.

Suggested Text / Reference Books:

1. J.F.Wakerly, Digital Design Principles and Practices, PH, 1999.
2. D.D. Givone, Digital Principles and Design, TMH, 2002
3. M. Raffiquzzman & Rajan Chandra, Modern Computer Architecture, Galgotia Publications, 1990.
4. David Patterson and John Hennessy, Computer Organization and Design, Elsevier, 2007.
5. MALVINO LEACH

Data Structure & Algorithm
Code: IT302
Contacts: 3L +1T
Credits: 4

Module -I. Linear Data Structure[8]
Introduction (2L):
Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type.
Algorithms and programs, basic idea of pseudo-code.
Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.
Array (2L):
Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials.
Linked List (4L):
Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.
Module -II: Linear Data Structure[7]
[Stack and Queue (5L):
Stack and its implementations (using array, using linked list), applications.
Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications.
Recursion (2L):
Principles of recursion – use of stack, differences between recursion and iteration, tail recursion.
Applications - The Tower of Hanoi, Eight Queens Puzzle.
Module -III. Nonlinear Data structures [15]
Trees (9L):
Basic terminologies, forest, tree representation (using array, using linked list).
Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree.
Binary search tree- operations (creation, insertion, deletion, searching).
Height balanced binary tree – AVL tree (insertion, deletion with examples only).
B- Trees – operations (insertion, deletion with examples only).
Graphs (6L):
Graph definitions and Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list.
Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications.
Minimal spanning tree – Prim's algorithm
Module - IV. Searching, Sorting:[10L]
Sorting Algorithms (5L): Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap), radix sort.
Searching (2L): Sequential search, binary search, interpolation search.
Hashing (3L): Hashing functions, collision resolution techniques.

Suggested Text / Reference Books:

1. "Data Structures And Algorithm using C", Amitiva Nag, J.P.Singh
2. "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.
3. "Data Structures in C" by Aaron M. Tenenbaum.
4. "Data Structures" by S. Lipschutz.
5. "Data Structures Using C" by Reema Thareja.
6. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
7. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.

Paper Name: Numerical Methods
Paper Code: IT303
Contacts:3L+1T
Credits:3

Module 1
Approximation in numerical computation:
Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors [2]

Module 2
Basic concept of C programming Language:
Datatype, Variable, Control Statements, Arrays, Functions. [5]

Module 3
Interpolation:
Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. [6]

Module 4
Numerical solution of Algebraic equation:
Bisection method, Regula-Falsi method, Newton-Raphson method, Secant's method. [6]

Module 5
Numerical Differentiation & Integration:
Numerical Differentiation**,** Numerical Integration using Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. [6]

Module 6
Numerical solution of a system of linear equations:
Gauss elimination method, Gauss- Jordan method, Matrix inversion, LU Factorization method, Jacobi iterative method, Gauss-Seidel iterative method. [8]

Module 7
Numerical solution of ordinary differential equation:
Euler's method, Modified Euler's method, Taylor's Series, Runge-Kutta methods, Predictor-Corrector methods.[9]

Suggested Text / Reference Books:

Text Books:

1. Dutta & Jana: Introductory Numerical Analysis, Shreedhar Prakashani.
2. Sastry: Introductory Methods of Numerical Analysis, PHI.
3. Let us C: Kanetkar, Yash Publication.

Reference Books:

1. Dey & Gupta: Numerical methods, TMH.
2. Mollah & Chakrabarty: Computing Systems, JBBL.
3. Sinha & Dinda: Numerical & Statistical Methods with Programming in C, Scitech.

Paper Name: Physics-II LAB
Paper Code: PH(IT) 391
Contact: 3
Credits: 2

Any 7 to be performed from the following experiments

Experiments on PHYSICS OF SEMICONDUCTORS & ENERGY BAND THEORY

1. Determination of band gap of a semiconductors/thermistor.
2. Determination of Hall co-efficient of a semiconductors.
3. Measurement of Magnetoresistance of a semiconductor.
4. Determination of velocity of ultrasonic wave using piezoelectric crystal & compressibility of the given liquid.

Experiments on SOLID STATE ELECTRONIC & OPTO ELECTRONIC DEVICES

5. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells & measurement of maximum workable power.
6. Study of I-V characteristics of a thyristor
7. Study of I-V characteristics of a LED.
8. Study of phototransistor.
9. Study of a temperature sensor characteristics.
10. Study of I-V characteristics of Tunnel diode.
11. Study of LDR characteristics.

Experiments on Magnetism & Storage devices

12. Study of hysteresis curve of a ferromagnetic material using CRO.
13. Use of paramagnetic resonance and determination of lande-g factor using esr setup.
14. Measurement of Curie temperature of the given sample.
15. Study of dipolar magnetic field behavior.

Paper Name: Digital Electronics Lab
Paper Code: IT391(EC)
Contact: 3
Credits: 2

Digital Circuit design using SSI/MSI:
Combinational Circuit design using gates,
MUX, decoders, arithmetic circuits,
ALU Sequential Circuits design - counters, shift registers,
sequence generators, signature detectors.

Paper Name: Data Structure & Algorithm Lab using C
Paper Code: IT392
Contacts: 3
Credits: 2

Experiments should include but not limited to :
Implementation of array operations:
Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem :
Evaluation of expressions operations on Multiple stacks & queues :
Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:
Polynomial addition, Polynomial multiplication
Sparse Matrices : Multiplication, addition.
Recursive and Nonrecursive traversal of Trees
Threaded binary tree traversal. AVL tree implementation
Application of Trees. Application of sorting and searching algorithms
Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

Paper Name: Numerical Methods Lab
Paper Name: IT393
Contacts: 3
Credits: 2

1.Assignments on Newton forward /backward, Lagrange's interpolation.
2.Assignments on numerical solution of Algebraic Equation by Bisection, Regular-falsi and Newton Raphson, Secant's methods.
3.Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule
4.Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations
5.Assignments on ordinary differential equation: Euler's and Runga-Kutta methods

Bachelor of Technology in Information Technology

2nd Year - Semester 4

Paper code	Name of the subjects	Periods			Credits	Total Credits	Marks		
		L	T	P			IE	FE	Total Marks
IT401	Computer Organization & Architecture	3	1	0	4	40	30	70	100
IT402	Operating System	3	1	0	4	40	30	70	100
IT403	Database Management System- I	3	1	0	4	40	30	70	100
IT404	Object Technology & UML	3	0	0	3	30	30	70	100
IT405	Formal Language and Automata Theory	3	1	0	3	30	30	70	100
IT491	Computer Organization & Architecture Lab	0	0	3	2	20	40	60	100
IT492	Operating System Lab	0	0	3	2	20	40	60	100
IT493	Database Management System- I Lab	0	0	3	2	20	40	60	100
IT494	Object Technology & UML Lab	0	0	3	2	20	40	60	100
IT495	Visual Programming Lab	0	0	3	2	20	40	60	100
HU481	Technical Report Writing & Language Laboratory	1	0	2	2	20	40	60	100
	Total	16	4	17	30	300	390	710	1100

Paper Name: Computer Organization & Architecture
Paper Code: IT401
Contacts: 3L+1T
Credits:4

Pre-requisite: Concept of basic components of a digital computer, Basic concept of Fundamentals & Programme
structures. Basic number systems, Binary numbers, representation of signed and unsigned numbers, Binary Arithmetic as covered in Basic Computation & Principles of Computer Programming Second semester, first year. Boolean Algebra, Karnaugh Maps, Logic Gates – covered in Basic Electronics in First year

Module – 1: [8L]

Basic organization of the stored program computer and operation sequence for execution of a program. Role of operating systems and compiler/assembler.

Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes. [7L]

Module – 2: [8L]

Overflow and underflow.Design of adders - ripple carry and carry look ahead principles. [3L]

Design of ALU. [1L]

Fixed point multiplication -Booth's algorithm. [1L]

Fixed point division - Restoring and non-restoring algorithms. [2L]

Floating point - IEEE 754 standard. [1L]

Module – 3: **[13L]**

Memory unit design with special emphasis on implementation of CPU-memory interfacing. [2L]

Memory organization, static and dynamic memory, memory hierarchy, associative memory. [3L]

Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies. (8L)

Module – 4: [13L]

Design of control unit - hardwired and microprogrammed control. [3L]

Introduction to RISC architectures. RISC vs CISC architectures. [2L]

I/O operations - Concept of handshaking, Polled I/O, interrupt and DMA. [3L]

Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques; [5L]

Module – 5: [6L]

Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, superpipelined and VLIW processor architectures. Array and vector processors. (6L)

Module – 6: [12 L]

Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture:

synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers. (8L)
Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures. (4L)

Suggested Text / Reference Books:

Text Books:
1. Mano, M.M., "Computer System Architecture", PHI.
2. Kai Hwang"Advance Computer Architecture" McGraw Hill
3. Behrooz Parhami " Computer Architecture", Oxford University Press
4. Nicholas P Carter"Computer Architecture & Organization" McGraw Hill,

Reference Book:
1. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
2. Hamacher, "Computer Organisation", McGraw Hill,
3. N. senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers" OUP
4. Chaudhuri P. Pal, "Computer Organisation & Design", PHI,
5. P N Basu- "Computer Organization & Architecture" , Vikas Pub

Paper Name: Operating System
Paper Code:IT402
Contacts: 3L+1T
Credits:4

Introduction [4L]
Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, timesharing,real-time, distributed, parallel.
System Structure[3L]
Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.
Process Management [17L]
Processes [3L]: Concept of processes, process scheduling, operations on processes, co-operating processes, interprocess communication.
Threads [2L]: overview, benefits of threads, user and kernel threads.
CPU scheduling [3L]: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS,SJF, RR, priority), algorithm evaluation, multi-processor scheduling.
Process Synchronization [5L]: background, critical section problem, critical region, synchronization hardware,
classical problems of synchronization, semaphores.
Deadlocks [4L]: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention,deadlock avoidance, deadlock detection, recovery from deadlock.
Storage Management [19L]
Memory Management [5L]: background, logical vs. physical address space, swapping, contiguous memory allocation,paging, segmentation, segmentation with paging.
Virtual Memory [3L]: background, demand paging, performance, page replacement, page replacement

algorithms (FCFS, LRU), allocation of frames, thrashing.
File Systems [4L]: file concept, access methods, directory structure, file system structure, allocation methods
(contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.
I/O Management [4L]: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices,network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering,caching, spooling and device reservation, error handling), performance.
Disk Management [3L]: disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk formatting, boot block, bad blocks.
Protection & Security [4L]
Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Suggested Text / Reference Books:

1. Milenkovie M., “Operating System : Concept & Design”, McGraw Hill.
2. Tanenbaum A.S., “Operating System Design & Implementation”, Practice Hall NJ.
3. Silbersehatz A. and Peterson J. L., “Operating System Concepts”, Wiley.
4. Dhamdhere: Operating System TMH
5. Stalling, William, “Operating Systems”, Maxwell McMillan International Editions, 1992.
6. Dietel H. N., “An Introduction to Operating Systems”, Addison Wesley.

Paper Name: Database Management System-I
Paper Code:IT403
Contacts: 3L+1T
Credits:4

Introduction [2L]
Why Database: Relation among DB, DBMS and DBS,Characteristics of Data in Database, Advantage of DBMS over FPS. Database models, Database Users, Role of DBA, Three Schema architecture of DBMS.
Entity Relationship Model [3L]
Components of ER Model, ER Modeling Symbols, Attribute inheritance, Extended E-R features: Super Class and Sub class types.
Relational DBMS [8L]
Introduction to Relational DBMS, RDBMS Terminology. Keys, Relationships, First Normal Form, Functional dependencies, Second Normal form, Third Normal Form, Boyce-Codd Normal form, Fourth Normal Form, Fifth Normal form, Case study.
Relational Algebra and Relational Calculus [4L]
Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.
Introduction to SQL [8L]
History of SQL, Characteristics of SQL, Advantages of SQL, SQL in Action SQL data types and Literals, Types of SQL commands, SQL Operators and their precedence, Tables, Views and indexes, Queries and Sub Queries, Aggregate functions, Insert, Update and Delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL, Embedded SQL.

Internals of RDBMS [6L]
Physical data structures, Query optimization : join algorithm, statistics and cost based optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, Serializability, lock base protocols, two phase locking, Timestamp protocol.

File Organization & Index Structures [6L]
File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree and hash tree .

Backup and Recovery [4L]
Database backups, Why plan backups?, Hardware protection and redundancy, Transaction logs, Database recovery, Data storage, Causes and classification of failures, Recovery concepts and terminology, Recovery facilities, Recovery techniques, Disaster Database Management System.

Database Security and Integrity [4L].
Types of Integrity constraints, Restrictions on integrity constraints, Data security Risks, Complex user management requirements, Dimensions of security, Data security requirements, Protecting data with in the database, Granting and revoking privileges and roles, System viability Factors, Authenticating users to the database.

Suggested Text / Reference Books:

Text Books:
1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, “Fundamentals of Database Systems”, Benjamin Cummings Publishing. Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, “Transaction Processing : Concepts and Techniques”, Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., “Introduction to Database Management”, Vol. I, II, III, Addison Wesley.
7. Ullman JD., “Principles of Database Systems”, Galgottia Publication.

Reference:
1. James Martin, “Principles of Database Management Systems”, 1985, Prentice Hall of India, New Delhi
2. “Fundamentals of Database Systems”, Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
3. “Database Management Systems”, Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

Paper Name: Object Technology & UML
Paper Code: IT404
Contacts: 3L+1T
Credits:3

Prerequisites of Object Oriented Programming & UML:
The fundamental point in learning programming is to develop the critical skills of formulating programmatic solutions for real problems. It will be based on basic knowledge of algorithms and procedural programming language. Once the basic skill of writing programs using loop, methods and

arrays will be clear then the student can develop object oriented software using class encapsulation and inheritance.

Object oriented design [10 L]

Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects,aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.

Object oriented concepts [4 L]

Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism

Basic concepts of object oriented programming using Java [22 L]

Implementation of Object oriented concepts using Java.Language features to be covered:

Class & Object proprieties [6L]

Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String (discuss charAt() , compareTo(),equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() ,trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(),ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods),concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes.

Reusability properties[6L] – Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.

Exception handling & Multithreading [6L] – Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes.

Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread
synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads.

Applet Programming (using swing) [4L] – Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint(), getDocumentBase(), getCodeBase() methods, layout manager (basic concept), creation of buttons (JButton class only) & text fields.

Textbooks/References:

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
6. Ivor Horton's Beginning Java 2 SDK – Wrox
7. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

Paper Name: Formal Language and automata Theory
Paper Code: IT405
Contacts: 3L+1T
Credits:3

Module 1:
Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram (Relating of Automata concept to sequential circuit concept)
Design of sequence detector, Introduction to finite state model
Finite state machine: Definitions, capability & state equivalent, kth- equivalent concept , Finite memory definiteness, testing table & testing graph.
Minimization of FSM-completely specified and incompletely specified(Merger graph, Merger table, Compatibility graph)
Equivalence between two FSM's , Limitations of FSM
Application of finite automata, Finite Automata with output- Moore & Melay machine. [11]

Module 2:
Deterministic finite automaton and non deterministic finite automaton. Transition diagrams and Language recognizers.
Finite Automata: NFA with Î transitions - Significance, acceptance of languages.
Conversions and Equivalence: Equivalence between NFA with and without Î transitions. NFA to DFA conversion. DFA minimization. Myhill- Nerode theorem
Regular Languages : Regular sets.Regular expressions, identity rules. Arden's theorem state and prove
Constructing finite Automata for a given regular expressions, Regular string accepted by NFA/DFA .
Pumping lemma of regular sets. Closure properties of regular sets (proofs not required).
Grammar Formalism: Regular grammars-right linear and left linear grammars.Equivalence between regular linear grammar and FA.[10]

Module 3:
Context free grammar. Derivation trees, sentential forms. Right most and leftmost derivation of strings. (Concept only)
Context Free Grammars, Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form and Greibach normal form.[9]
Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted). Closure property of CFL, Ogden's lemma & its applications .
Push Down Automata: Push down automata, definition.
Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence.
Equivalence of CFL and PDA, interconversion.Introduction to DCFL and DPDA. [9]

Module 4:
Turing Machine : Turing Machine, definition, model [1L]
Design of TM, Computable functions,Church's hypothesis, counter machine,Types of Turing machines
Universal Turing Machine, Halting problem[6]

Suggested Text / Reference Books:

Text Books:

1. Switching & Finite Automata, ZVI Kohavi, 2nd Edn., Tata McGraw Hill
2. An Introduction to Computing , Peter Linz, Narosa. Reference Books:
3. Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D.,

Pearson education.
4 .Theory of Computer Science ", Automata Languages and computation", Mishra and Chandrashekaran, 2nd edition, PHI.
5. Formal Languages and Automata Theory, C.K.Nagpal, Oxford.
6. Introduction to languages and the Theory of Computation, John C Martin, TMH
7. Theory of Computation ,Verma & Rao.SCITECH edition.

Paper Name: Computer Organization &Computer Architecture Lab
Paper Code: IT491
Contacts:3P
Credits:2

1. Implementation of simple 8-to-1 line and 4-to-1 line Multiplexer
2. Realization of the basic gates (AND, OR, NOR, NOT, NAND).
3. Implementation of HALF ADDER circuit using basic gates and verify its output.
4. Implementation of FULL ADDER circuit using basic gates and verify its output.
5. Implementation of HALF SUBTRACTER circuit using basic gates and verify its output.
6. Implementation of FULL SUBTRACTER circuit using basic gates and verify its output.
7. Implementation of 1:4 De-Multiplexer and 1:8 De-Multiplexer
8. Implementation of 2:4 decoder and 3:8 Decoder using logic gates.
9. Implementation of 4:2 Encoder and 8:3 En coder using logic gates.
10. Implementation of Binary to its corresponding Gray conversion and vice versa.
11. Implementation of 4-bit Comparator.
12. Implementation of D-Flip-Flop and SR- Flip-Flop,JK Flip-Flop and T Flip-Flop.
13. Implementation of Circuit for 8-bit adder.
14. Implementation of ALU Design.
15. Implementation of CPU Design.

Paper Name: Operating System Lab
Paper Code:IT492
Contacts: 3P
Credits:2

1. **Managing Unix/Linux Operating System [8P]:**
Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions,commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock,I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users & user groups.
2. **Process [4P]**: starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
3. **Signal [4P]**: signal handling, sending signals, signal interface, signal sets.
4. **Semaphore [6P]**: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
5. **POSIX Threads [6P]**: programming with pthread functions (viz. pthread_create, pthread_join, pthread_exit,

pthread_attr_init, pthread_cancel)
6. **Inter-process communication [6P]**: pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO),message passing & shared memory(IPC version V).

Paper Name: Database Management System-I Lab
Paper Code:IT493
Contacts: 3P
Credits:2

Structured Query Language
1. **Creating Database**
_ Creating a Database
_ Creating a Table
_ Specifying Relational Data Types
_ Specifying Constraints
_ Creating Indexes
2. **Table and Record Handling**
_ INSERT statement
_ Using SELECT and INSERT together
_ DELETE, UPDATE, TRUNCATE statements
_ DROP, ALTER statements
3. **Retrieving Data from a Database**
1. The SELECT statement
2. Using the WHERE clause
3. Using Logical Operators in the WHERE clause
4. Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING
Clause
5. Using Aggregate Functions
6. Combining Tables Using JOINS
7. Subqueries
4. **Database Management**
_ Creating Views
_ Creating Column Aliases
_ Creating Database Users
_ Using GRANT and REVOKE
Cursors in Oracle PL / SQL
Writing Oracle PL / SQL Stored Procedures

Paper Name: Object Technology & UML Lab
Paper Code:IT494
Contacts: 3P
Credits:2

1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on wrapper class, arrays
3. Assignments on developing interfaces- multiple inheritance, extending interfaces
4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming

6. Assignments on applet programming
Note: Use Java for programming
Preferably download "**java_ee_sdk-6u4-jdk7-windows.exe**" from
http://www.oracle.com/technetwork/java/javaee/downloads/java-ee-sdk-6u3-jdk-7u1-downloads-523391.html

Paper Name: Visual Programming Lab
Paper Code:IT495
Contacts: 3P
Credits:2

Introduction to Visual Basic & difference with BASIC.
Concept about form Project, Application, Tools, Toolbox,
i. Controls & Properties. Idea about Labels, Buttons,Text Boxes.
ii. Data basics, Different type variables & their use in VB,
iii. Sub-functions & Procedure details, Input box () & Msgbox ().
iv. Making decisions, looping
v. List boxes & Data lists, List Box control, Combo Boxes, data Arrays.
vi. Frames, buttons, check boxes, timer control,
vii. Programming with data, ODBC data base connectivity.
viii. Data form Wizard, query, and menus in VB Applications,
ix. Graphics.
9. Case studies using any of the following items including relevant form design with the help of visual programming aids.
a) Payroll accounting system.
b) Library circulation management system.
c) Inventory control system.
d) University examination & grading system.
e) Patient information system.
f) Tourist information system.
g) Judiciary information system.
h) Flight reservation system.
i) Bookshop automation software.
j) Time management software.

Paper Name : Technical Report Writing & Language laboratory practice
Paper code: HU481
Contact: 1l+2p
Credit : 2
Guidelines for Course Execution:
Objectives of this Course: This course has been designed:
1. To inculcate a sense of confidence in the students.

2. To help them become good communicators both socially and professionally.
3. To assist them to enhance their power of Technical Communication.
Detailed Course Outlines:
A. ***Technical Report Writing*** : 2L+6P
1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)
B. ***Language Laboratory Practice***
I. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory Practice Sessions :2L
2. Conversation Practice Sessions: (To be done as real life interactions) 2L+4P
a) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their
Listening Skill & Speaking Skill honed
b) Introducing Role Play & honing over all Communicative Competence
3. Group Discussion Sessions: 2L+6P
a) Teaching Strategies of Group Discussion
b) Introducing Different Models & Topics of Group Discussion
c) Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure
Interview Sessions; 2L+6P
a) Training students to face Job Interviews confidently and successfully
b) Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking
Skill in a formal situation for effective communication
4. Presentation: 2L+6P
a) Teaching Presentation as a skill
b) Strategies and Standard Practices of Individual /Group Presentation
c) Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids
5. Competitive Examination: 2L+2P
a) Making the students aware of Provincial /National/International Competitive Examinations
b) Strategies/Tactics for success in Competitive Examinations
c) SWOT Analysis and its Application in fixing Target
Books – Recommended:
Nira Konar: English Language Laboratory: A Comprehensive Manual
PHI Learning, 2011
D. Sudharani: Advanced Manual for Communication Laboratories &
Technical Report Writing,Pearson Education (W.B. edition), 2011
References:
Adrian Duff et. al. (ed.): Cambridge Skills for Fluency
A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)
B) Listening (Levels 1-4 Audio Cassettes/Handbooks)
Cambridge University Press 1998
Mark Hancock: English Pronunciation in Use
4 Audio Cassettes/CD'S OUP 2004

B. Tech in Information Technology

3rd Year - Semester 5

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
IT501	Data Communication and Networking (Networking I)	3	1	0	4	30	70	100
IT502	Microprocessor & Microcontroller	3	1	0	4	30	70	100
IT503	Database Management System- II	3	1	0	4	30	70	100
IT504	Software Engineering & Project Management	3		0	3	30	70	100
IT505	A. Artificial Intelligence B. Operation Research & Optimization Techniques C. Computer Graphics D. Object Oriented Programming with C++	3	1	0	4	30	70	100
IT591	Data Communication &Networking/Networking I Lab	0	0	3	2	40	60	100
IT592	Microprocessor & Microcontroller Lab	0	0	3	2	40	60	100
IT593	Database Management System- II Lab	0	0	3	2	40	60	100
IT 594	Software Engineering & Project Management Lab	0	0	3	2	40	60	100
IT595	A. Artificial Intelligence Lab B. Operation Research & Optimization Techniques Lab C. Computer Graphics Lab D. Object Oriented Programming with C++ Lab	0	0	3	2	40	60	100
	Total	15	4	15	29	350	650	1000
MC581	Project and Technical Report Writing and Presentation on Industrial Training-I (2 weeks duration)	0	0	0	Mandatory course			
MC582	General Proficiency-I (General aptitude, Technical Communication & Soft Skill)	0	0	3	Mandatory course			
MC583	Professional Certification Program I	0	0	0	Mandatory course			

B. Tech in Information Technology
3rd Year - Semester 5

Paper Name: Data Communication and Networking (Networking I)
Paper Code: IT 501
Contacts:3L+1T
Credit:4

Overview of Data Communication and Networking: [4L]
Introduction; Data communications: components, data representation (ASCII,ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI and TCP/IP.

Physical Level: [6L]
Overview of data (analog & digital), signal(analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network;

Data link Layer: [9L]
Types of errors, framing, error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC; Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet;

Network layer: [8L]
Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : IP addressing, subnetting; Routing : techniques, Routing Protocols, ARP, IP, ICMP, IPV6;.

Transport layer: [7L]
Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm,

Application Layer [6L]
Introduction to DNS, SMTP, SNMP, FTP, HTTPS, Firewalls.

Suggested Text / Reference Books:

1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH
2. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
3. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education
4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
5. Black, Data & Computer Communication, PHI

Paper Name: Microprocessor & Microcontroller
Paper Code: IT 502
Contacts:3L+1T
Credit:4

Module -1: **[8L]**
Introduction to Microcomputer based system. History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages. [1L]
Architecture of 8085 Microprocessor, Pin description of 8085. [2L]
Address/data bus Demultiplexing , Status Signals and the control signals. [1L]
Instruction set of 8085 microprocessor, Addressing modes, [3L]
Timing diagram of the instructions (a few examples). [1L]

Module -2: **[9L]**
Assembly language programming with examples, Counter and Time Delays,Stack and Subroutine [6L]
Interrupts of 8085 processor(software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O , Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer, [3L]

Module 3: **[10L]**
The 8086 microprocessor- Architecture, Addressing modes, Interrupts [3L]
Introduction to 8051 Microcontroller –Architecture, Pin Details [3L]
Addressing modes, Instruction set, Examples of Simple Assembly Language. [4L]

Module -4: **[9L]**
Memory interfacing with 8085, 8086 [2L]
Support IC chips- 8255 ,8251,8237/8257,8259 [4L]
Interfacing of 8255 PPI with 8085 and Microcontroller 8051. [2L]
Brief introduction to PIC microcontroller (16F877) [1L]

Suggested Text / Reference Books:

1. Fundamentals of microprocessor and microcontroller- B.Ram
2. The 8051 Microcontroller and Embedded System- Mazidi
3. Microprocessor Architecture, Programming and Applications with the 8085- Ramesh s Gaonkar

Paper Name: Database Management System- II
Paper Code: IT 503
Contacts:3L+1T
Credit:4

Unit I Transactions :
Transaction concept, Transaction state, Implementation of atomicity and durability, Concurrent executions, Serializability, Recoverability, Implementation of isolation, Testing for serializability. (4 Hours)

Concurrency Control : Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Multiple granularity, Multiversion schemes, Deadlock handling, Insert and delete operations, Weak levels of consistency, Concurrency in index structures (6 Hours)

Unit II

Recovery System : Failure classification, Storage structure, Recovery and atomicity, Log-based recovery, Recovery with concurrent transactions, Buffer management, Failure with loss of nonvolatile storage, Advanced recovery techniques, Remote backup systems. (4 Hours)

Unit III

Database-System Architectures :

Centralized and client–server architectures, Server system architectures, Parallel systems, Distributed systems, Network types. (4 Hours)

Parallel Databases :

Parallel databases, I/O parallelism, Interquery parallelism, Intraquery parallelism, Intraoperation parallelism, Interoperation parallelism, Design of parallel systems. (4 Hours)

Unit IV

Distributed Databases:

Homogeneous and heterogeneous databases, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed databases, Directory systems. (5 Hours)

Object-Based Databases:

Overview of object-based databases, Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multiset types in SQL, Introduction of object-identity and reference types in SQL, Object-oriented versus object-relational. (5 Hours)

Unit V

Advanced Application Development :

Performance tuning, Performance benchmarks, Standardization, Application migration. (1 Hours)

Advanced Data Types & New Applications

Motivation, Time in databases, Spatial and geographic data, Multimedia databases, Mobility and personal databases, Temporal database. (3 Hours)

Advanced Transaction Processing

Transaction-processing Monitors, Transactional workflows, E-Commerce, Main-memory databases, Real-time transaction systems, Long-duration transactions, Transaction management in multidatabases (5 Hours)

Unit VI

XML :

Motivation, Structure of XML data, XML document schema, Querying and transformation, Application program interfaces to XML, Storage of XML data, XML applications, UML. (5 Hours)

Suggested Text / Reference Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
3.H.B.Singh- Database Management System

Paper Name: Software Engineering & Project Management
Paper Code: IT 504
Contacts:3L
Credit: 3

Module 1
Introduction
Software, Type of software, Definition of Software Engineering, Aim and Objective. 1L

Module 2
Software Development Life-cycle 2L
Feasibility Study, Requirements gathering and analysis, SDLC, steps involve in SDLC, maintenance, Role of metrics and measurement.

Module 3
Software Development Life-Cycle Model 5L
Waterfall model, prototyping, iterative enhancement model, evolutionary model incremental model, spiral model. Implementation level and Comparative study of different model

Module 4 5L
Software Requirement Specification
Problem analysis, formal specification, requirement specification, validation, metrics.

Module 5 4L
System Design
Design, Problem partitioning, abstraction, top-down and bottom-up design, Structured approach. Functional versus object-oriented approach, design specification and verification metrics, monitoring and control, Cohesion and Coupling.

Module 6
Coding 4L
Introduction to Coding Standard and Specification, Top-down and bottom-up approaches, structured programming, information hiding, programming style, and internal documentation. Verification, Metrics,

Module 8
Testing 8L
Test plane, test cases specification, Levels of testing functional testing, structural testing, and reliability assessment. Error handling.

Module 9 8L
Software Project Management and maintenance
Cost estimation, Project scheduling, Staffing, Software configuration management, Quality assurance, Project Monitoring control, Risk management.

Module10

CASE Tool concept, UML: Different types of diagram and chart concept 5L

Suggested Text / Reference Books:

1. Software Engineering - Rajib Mal
2. Software Engineering- Pressman (Pearson Ed.)
3. Software Engineering – Jawadekar (MGH)

Paper Name: Artificial Intelligence
Paper Code: IT 505 A
Contacts:3L+1T
Credit:4

UNIT I – INTRODUCTION 8L

Intelligent Agents- Agents and environments-Good behavior- The nature of environments-structure of agents-Problem Solving agents-example problems-Searching for solutions- uninformed search strategies-avoiding repeated states- searching with partial information.

UNIT II – SEARCHING TECHNIQUES 10L

Informed search and exploration- Informed search strategies- heuristic function-Local search algorithms and optimistic problems- local search in continuous spaces-online search agents and unknown environments-constraint satisfaction problems (CSP)-Backtracking search and Local search for CSP-structure of problems-Adversarial search- Games-Optimal decisions in games-Alpha-Beta pruning-imperfect real-time decision- games that include and element of chance.

UNIT III – KNOWLEDGE REPRESENTATION 10L

First order logic-representation revisited-Syntax and semantics for first order logic-using first order logic-Knowledge engineering in first order logic-inference in first order logic-prepositional versus first order logic-unification and lifting-forward chaining-backward chaining-resolution-knowledge representation-ontological engineering-categories and objects-actions-simulation and events-mental events and mental objects.

UNIT IV – LEARNING 9L

Learning from observations-forms of learning- Inductive learning-Learning decision trees-ensemble learning-knowledge in learning-logical formulation of learning-explanation based learning-learning using relevant information-inductive logic programming-statistical learning methods-learning with complete data-leaning with hidden variable-EM algorithm- Instance based learning-Neural networks-Reinforcement learning-Passive reinforcement learning-Active reinforcement learning-Generalization in reinforcement learning.

UNIT V – APPLICATIONS 8L

Communication-communication as action-formal grammar for a fragment of English-Syntactic analysis-Augmented grammars-Semantic interpretation-Ambiguity and disambiguation-Discourse understanding-Grammar induction-Probabilistic language processing- Probabilistic language models-Information retrieval-Information extraction-Machine translation.

Suggested Text / Reference Books:

1. Stewart Russell and Peter Norvig. " Artificial Intelligence-A Modern Approach ", Pearson Education.
2. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd.,
3. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill,
4. George F. Luger, "Artificial Intelligence-Structures And Strategies For Complex Problem Solving", Pearson Education

Paper Name: Operation Research & Optimization Techniques
Paper Code: IT 505 B
Contacts:3L+1T
Credit:4

Module I

Linear Programming Problems (LPP): Basic LPP and Applications; Various Components of LP Problem Formulation.

Solution of Linear Programming Problems: Solution of LPP: Using Simultaneous Equations and Graphical Method; Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples. [**5L]**
Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory. Transportation Problems and Assignment Problems. [**12L]**

Module II

Network Analysis: Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded). [**6L]**

Inventory Control: Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.[**3L]**

Module III

Game Theory: Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems;Games without Saddle Point; Graphical Method; Principle of Dominance.[**5L]**

Module IV

Queuing Theory:

Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems.[**5L]**

Suggested Text / Reference Books:

1. H. A. Taha, "Operations Research", Pearson
2. P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3. Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4. Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA
5. Kanti Swaroop — "Operations Research", Sultan Chand & Sons
6. Rathindra P. Sen—"Operations Research: Algorithms and Applications", PHI

Paper Name: Computer Graphics
Paper Code: IT 505 C
Contacts:3L+1T
Credit:4

Module I:[14L]

Introduction to computer graphics & graphics systems [6L]: Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Scan conversion [8L]: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module II:[20L]

2D transformation & viewing [15L]: Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method

3D transformation & viewing [5L]: 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, view port clipping, 3D viewing.

Module III: [11L]

Curves [3L]: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden surfaces [3L]: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry.

Color & shading models [2L]: Light & color model; interpolative shading model; Texture.

Introduction to Ray-tracing: [3L]: Human vision and color, Lighting, Reflection and transmission models.

Suggested Text / Reference Books:

1. Hearn & Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH

Paper Name: Object Oriented Programming with C++
Paper Code: IT 505 D
Contacts:3L+1T
Credit:4

Introduction [3L]

Programming paradigms,Language translator, **B**asics of OOP, Structure of C++ program, Class and object, Abstraction and
encapsulation, Polymorphism, Inheritance, Static and dynamic binding.

Declaration, Expression and statements [4L]

Data types, Variables, Constants, Operator and expression, Operator precedence and associativity. Statements: Labelled, Expression, Compound, Control, Jump, Declaration, Try-throw-catch.

Array, pointer and function [4L]

Array, Addresses, Pointer. Function: Declaration, Definition and call, Inline function, Main function argument, Reference variable, Function overloading, Default argument, Parameter passing, Recursion, Scope of variable, Return-by-value and Return-by-reference, Pointer to function

Data abstraction through classes and user defined data types [6L]

Class, Members, Constructor and destructor, Copy constructor.
Dynamic memory management: Operators new and delete, Malloc and free, Static member, Scope of class names, Scope of variables.

Operator Overloading [5L]

Overloading unary and binary operator, Overloaded function calls, Subscripting, class member access, Non-member operator, New and delete, Cast operator.

Class relationships [6L]

Introduction, Polymorphism, Coercion, Overloading, Parametric and inclusion polymorphism
Inheritance: direct and indirect superclasses, Multiple inheritance, Virtual base class,Friend, Virtual function, Abstract class, Overriding and hiding, Dynamic binding of functions, Virtual destructor and operators.

Template and Exception Handling [5L]

Class template, Member function inclusion, Function template, Specialization,Inheritance, Namespace.
Concept of exception handling, Catch block, Nested try-catch block, Condition expression in throw expression, Constructor & destructor, Runtime standard exception

Standard Library in C++ [3L]

Standard library function, Input and output, Iostream class hierarchy, Class ios, Other stream classes.

Object oriented design and modelling [4L]

Software development, Qualities of software system, Software architecture, Process life cycle, phases, Modularity, OO methodology, Modeling, UML overview, Object oriented design patterns.

Suggested Text / Reference Books:

1. Objected Oriented Programming with C++- E. Balaguruswamy
2. Schildt, H., The Complete Reference C++, McGraw – Hill.
3. C++ object oriented programming paradigm, Debasish Jana, PHI
4. Pooley, R and P. Stevens, Using UML , Addison-Wesley.
5. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
6. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
7. Rajaram: Object Oriented Programming and C++, New Age International

Paper Name: Computer Networking Lab
Paper Code: IT591
Contacts : 3P
Credits: 2

NIC Installation & Configuration (Windows/Linux)
Understanding IP address, subnet etc

Familiarization with

- Networking cables (CAT5, UTP)
- Connectors (RJ45, T-connector) Hubs, Switches
- TCP/UDP Socket Programming
- Simple, TCP based, UDP basedMulticast & Broadcast Sockets

Implementation of a Prototype Multithreaded Server

Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window), Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check), Data Link Layer Error Control mechanism (Selective Repeat, Go Back N)

Server Setup/Configuration

FTP, TelNet, NFS, DNS, Firewall.

Socket programming

Paper Name: Microprocessor & Microcontroller Lab
Paper Code: IT592
Contacts : 3P
Credits: 2

Sl	Content	Hours
1	Study of Prewritten programs on 8085 trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical). **Or,** Familiarization with 8085 simulator on PC. Programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator.	3
2	**Programming using kit or Simulator for:** 1. Table look up 2. Copying a block of memory 3. Shifting a block of memory iv) Packing and unpacking of BCD numbers 4. Addition of BCD numbers	18

	5. Binary to ASCII conversion and vice-versa (Using Subroutine Call) 6. BCD to Binary Conversion and vice-versa vii) String Matching, Multiplication	
3	Program using IN/OUT instructions and 8255 PPI on the trainer kit e.g. subroutine for delay, 1. Glowing all the LEDs one by one with particular delay 2. Reading switch state and glowing LEDs accordingly.	3
4	Serial communication between two trainer kits	3
5	Study of Prewritten programs on 8051 Microcontroller Kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical). **Or,** Familiarization with 8051 Simulator on PC. Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical).	3
Total 30 hours (10 classes each of 3 periods)		

Paper Name: Database Management System- II Lab
Paper Code: IT593
Contacts : 3P
Credits: 2

1.Study of Backend Tool – Oracle.
2. Data Definition Language (DDL) commands in RDBMS.
3. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
4. High-level language extension with Cursors.
5. High level language extension with Triggers
6. Procedures and Functions.
7. Embedded SQL.
8. Database design using E-R model and Normalization.
9. Mini project (Application Development using Oracle and Visual Basic)
i.Inventory Control System.
ii.Material Requirement Processing
iii.Hospital Management System
iv.Railway Reservation System
v.Personal Information System
vi.Web Based User Identification System
vii.Time-table Management System

Suggested Text / Reference Books:
1. Oracle 10g complete reference
2. Pl/SQL

Paper Name: Software Engineering & Project Management Lab
Paper Code: IT594
Contacts : 3P
Credits: 2

1. Preparation of requirement document for proposed project in standard format.
2. Project Schedule preparation using tools like MSProject.Generation of Gnatt and PERT chart from schedule.Prepare Project Management Plan in standard format.
3. Draw Use Case diagram,Class diagram,Sequence diagram and prepare Software Design Document using tools like Rational Rose.
4. Estimate project size using Function Point(FP)/Use Case Point.Use Excel/Open Office template for calculation.
5. Design Test Script/Test Plan(both Black box and WhiteBox approach) for a small component of the proposed project.(Develop that component using programming languages like c/Java/VB etc.)
6.Generate Test Result and perform defect root cause analysis using Pareto or Fishbone diagram.
7. Compute Process and Product Metrics (e.g Defect Density,Defect Age,Productivity,Cost etc.)
8. Familiarization with any Version Control System like CVS/VSS/Pvcs etc.

(Following projects can be used as dummy projects:
Library Management System
Railway Reservation System
Employee Payroll
Online Banking System
Online Shopping Cart
Online Examination)

Paper Name: Artificial Intelligence Lab
Paper Code: IT595A
Contacts : 3P
Credits: 2

Sl. No.	Topics
1	**Preamble:** Introduction to fact base programming, Prolog, SWI-Prolog as tool, Download and Install
2	**Facts:** Simple facts and facts with arguments
3	**Variables & Unifications** Simple Unification Variable Unifications
4	**Rules** Simple Predicates, How to add a rule with program
5	**Back tracking** Fail, Cut, Not
6	**Recursion**

	Family tree, Factorial
7	**Input & Output** Read and Write
8	**Operators and Arithmetic**
9	**Graph Traversal** Depth First Search, Breadth First Search

Paper Name: Operation Research & Optimization Techniques Lab
Paper Code: IT595B
Contacts : 3P
Credits: 2

Software based Lab using C /C++

1. Assignment on Transportation problem.
2. Assignment on Assignment problem
3. Assignment on Duality
4. Assignment on Simplex method (Including Charns' Big-M Method)
5. Assignment on Shortest Path by using Dijkstra's or Floyd's Algorithm
6. Assignment on Maximal Flow Problem (Ford-Fulkerson Method).
7. Assignment on PERT/CPM
8. Familiarization with O.R package: TORA

Paper Name: Computer Graphics Lab
Paper Code: IT595C
Contacts : 3P
Credits: 2

1. Implementation of Bresenhams Algorithm – Line, Circle, Ellipse.
2. Implementation of Line, Circle and ellipse Attributes.
3. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
4. Composite 2D Transformations.
5. Cohen Sutherland 2D line clipping and Windowing
6. Sutherland – Hodgeman Polygon clipping Algorithm.
7. Three dimensional transformations - Translation, Rotation, Scaling.
8. Composite 3D transformations.
9. Drawing three dimensional objects and Scenes.
10. Generating Fractal images.

Paper Name: Object Oriented Programming with C++ Lab
Paper Code: IT595D
Contacts : 3P
Credits: 2

Introduction of UNIX/Linux Operating System which includes preliminary commands, start-up & shutdown methodology, file handling as well as introduction to editors like Vi editor, introduction to GNU C & C++ compiler, as well as introduction to GNU & GDB script. **[4P]**

Introduction to C++, basic loop control, executing programs, writing functions, selection statements, review of functions and parameters, command line arguments, recursion, I/O streams, arrays and string manipulation, pointers, structures & unions**. [6P]**

Object-Oriented Programming in C++, fundamentals of classes, constructors-destructors.
Dealing with member functions, operator overloading and polymorphism (both static & dynamic). **[6P]**

Dealing with inheritance, derived class handling, abstract class, virtual class, overriding, template class, name-space & exception handling. **[4P]**

Dynamic memory allocation, implementation of Linked Lists, using C++. **[4P]**

B. Tech in Information Technology

3rd Year - Semester 6

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
IT601	System Software & Network Administration (Networking II)	3	1	0	4	30	70	100
IT602	Web Technology(Advance Java & J2EE)	3	1	0	4	30	70	100
IT603	Soft Computing	3	0	0	3	30	70	100
IT604	Multimedia Technology	3	0	0	3	30	70	100
IT605	A. Design Analysis of Algorithm B. Digital Image Processing C. Advanced Operating System	3	1	0	4	30	70	100
IT691	System Software & Network Administration Lab/Networking II Lab	0	0	3	2	40	60	100
IT692	Web Technology lab (Advance Java & J2EE Lab)	0	0	3	2	40	60	100
IT693	Soft Computing Lab	0	0	3	2	40	60	100
IT694	Multimedia Technology Lab	0	0	3	2	40	60	100
HU691	Foreign Language Lab(Japanese/French/German/Spanish)	0	0	3	2	40	60	100
	Total	15	3	15	28	350	650	1000
MC681	Project ,Technical Report Writing and Presentation on Industrial Training-II (2 weeks duration)	0	0	0	Mandatory course			
MC682	General Proficiency-II (General aptitude, Technical Communication & Soft Skill)	0	0	3	Mandatory course			
MC683	Professional Certification Program II	0	0	0	Mandatory course			

B. Tech in Information Technology
3rd Year - Semester 6

Paper Name: System Software & Network Administration (Networking II)
Paper Code: IT601
Contacts: 3L
Credits: 4

Introduction [4L]
Duties of the Administrator, Administration tools, Overview of permissions. Processes: Process status, Killing processes, process priority. Starting up and Shut down: Peripherals, Kernel loading, Console, The scheduler, init and the init tab file, Run-levels, Run level scripts.

Managing User Accounts: [3L]
Principles, password file, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users.

Managing Unix File Systems: [3L]
Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Boot disks.

Configuring the TCP/IP Networking : [5L]
Kernel Configuration; Mounting the /proc File system, Installing the Binaries, Setting the Hostname, Assigning IP Addresses, Creating Subnets, Writing hosts and networks Files, Interface Configuration for IP, ifconfig, netstat command, Checking the ARP Tables; Name service and resolver configuration.

TCP/IP Firewall :[7L]
Methods of Attack, Firewall, IP Filtering. Setting Up Linux for Firewalling Testing a Firewall Configuration; A Sample Firewall Configuration: IP Accounting, Configuring the Kernel for IP Accounting, Configuring IP Accounting, Using IP Accounting Results.

IP Masquerade and Network Address Translation : [5L]
Side Effects and Fringe Benefits, Configuring the Kernel for IP Masquerade, Configuring IP Masquerade

The Network Information System : [4L]
Getting Acquainted with NIS, NIS Versus NIS+ , The Client Side of NIS, Running an NIS Server, NIS Server Security.

Network file system: [4L]
Preparing NFS, Mounting an NFS Volume, The NFS Daemons, The exports File.

System Backup & Recovery: [4L]
Log files for system and applications; Backup schedules and methods (manual and automated).

Suggested Text / Reference Books:

Books
1. L.L. Beck – "System Software " (3^{rd} Ed.)- Pearson Education

References
2. Michel Ticher – "PC System Programming" , Abacus.
3. Kirch – " Linux network Administrator's guide (2^{nd} Ed.)" – O'Rielly
4. Maxwell – "Unix system administration" - TMH
5. Limoncelli –"The Practice of System & Network Administration"-Pearson
6. Wells, LINUX Installation & Administration, Vikas

Paper Name: Web Technology(Advance Java & J2EE)
Paper Code: IT602
Contacts: 3L
Credits: 4

Introduction to World Wide Web [1L]:
Web Architecture, Web Applications, Web servers, Web Browsers and Agents, Internet standards, DNS, SMTP etc.
Classification of Web Protocols [1L]:
Pull and Push mechanism: Pros and Cons. HTTP, HTTPS, XMPP

Mark-up [2L]: HTML 4.x: Elements, Attributes, Tags, Forms, Input, Frames, Tables.

Cascading Style Sheets [1L]: Advantages, Rules, CSS, inline and external, using template Layouts,

JavaScript and DHTML [4L]: Language basics: variables, control statements, inbuilt objects. Achieving interactive static web page with Java script: validation of user input, disabling event propagation stack, manipulation of DOM hierarchy, event bubbling, Fancying with multiple windows and DOM**.**

Non-Browser Web Agents [2L]: Limitation of Applets**:** Security Policy, Signing an Applet, HTTP Tunneling, Programmatically issuing HTTP GET, POST etc. and retrieval of content

Server-side Programming [6L]: Servlets: Concept of Dynamic Web pages, Web server versus Application server, Role of threading in a Server, Servlet-2.x API conforming to Web 2.0: Role of ***web.xml*** as deployment descriptor, request and response, Basic request handling, parameter retrieval, multiple parameter retrieval, inter-Servlet collaboration: Dispatching the request, Concept of state of web: Sessions , tracking session, Using Cookies and *jsessionId*, Parameter passing to and from session, Servlet Filters and common uses of Filters and Cookies. Migration to Servlet 3.x plus and omission of web.xml and concept of WebSocket.

Persistence: JDBC 3.x framework [4L]: Need and different approaches of persistence of data, Connecting to databases using ***jdbc:odbc*** bridge and Type-4 drivers, Executing basic CRUD using JDBC: *Statement*, *PreparedStatement*, *ResultSet*.

Execution of batch SQL, Stored Procedures using *CallableStatement*, Transaction Failure management: Save Point and roll back concepts, Prevention of *SQL injection*, Concept of connection URL in details: Connecting to a remote database host (server). Concept of roles of Drivers: Java reflection in Action.

Java Server Pages [7L]: Benefits of JSP over Servlets, JSP scriptlets, page directives, declarations, action tags: <**jsp:useBeabn**/>, <**jsp:include**/> <**jsp:forward**/>, introducing **MVC architecture** and its different patterns. **Introduction to Struts**

XML Technologies [2L]: XML, Namespace, DTD, W3C XML Schema

Ajax [2L]: Introduction to Asynchronous pattern and Using XML to communicate over XMLHttpRequest object. Handling 5 states and finding response state. Migration of Ajax to AJAJ

Overview of EJB 2.x [7L]: Need of EJB, Session Beans: Stateless & Stateful, Entity Beans *CMP, BMP***,** Message Driven Beans.

Suggested Text / Reference Books:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent Learning Solutions INC.

Paper Name: Soft Computing
Paper Code: IT603
Contacts: 3L
Credits: 3

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

GENETIC ALGORITHMS 9L

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning – Machine Learning Approach to Knowledge Acquisition.

NEURAL NETWORKS **11L**
Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

FUZZY LOGIC **11L**
Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making

NEURO-FUZZY MODELING **4L**
Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies

Hybrid Systems **4L**
Hybrid systems, GA based BPNN (Weight determination, Application); Neuro Fuzzy Systems—Fuzzy BPNN--fuzzy Neuron, architecture, learning, application; Fuzzy Logic controlled GA;

Suggested Text / Reference Books:

Textbooks:
1. Neural Networks- A Comprehensive foundation, Simon Haykin, 2nd Ed; Pearson
2. Fuzzy Sets & Fuzzy Logic, Klir & Yuan, PHI
3. Genetic Algorithm – Melanie Mitchell, PHI

References:
4. Neural Networks, Fuzzy Logic & Genetic Algorithms – Synthesis & applications, T.S. Rajasekaran & G.A. Vijaylakshmi Pai, PHI
5. Genetic Algorithm & fuzzy Logic Systems - Sanchez, Takanori, Zadeh; World Scientific
6. Genetic Algorithm, Goldberg David E.; Pearson
7. Fuzzy Set Theory & Its Applications - Zimmermann H. J.; Allied Publishers Ltd.
8. Fundamentals of Neural Networks, architectures, algorithms & applications --- Laurence Fausett; Prentice Hall, Englewood Clifts.

Paper Name: Multimedia Technology
Paper Code: IT604
Contacts: 3L
Credits: 3

Introduction
Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications

Text and Audio
Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption; Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer

Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI

Image and Video
Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.

Synchronization
Temporal relationships, synchronization accuracy specification factors, quality of service

Storage models and Access Techniques
Magnetic media, optical media, file systems (traditional, multimedia) Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD

Document Architecture and Content Management
Content Design and Development, General Design Principles
Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML)in Web Publishing. Case study of Applications

Multimedia Applications
Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications,
Multimedia archives and digital libraries, media editors

Suggested Text / Reference Books:

Books:
1. Principles of multimedia- Ranjan Parekh
Reference:
2. Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.
3. Nalin K. Sharda , Multimedia Information System , PHI.
4. Fred Halsall , Multimedia Communications , Pearson Ed.
5. Koegel Buford , Multimedia Systems , Pearson Ed.
6. Fred Hoffstetter , Multimedia Literacy , McGraw Hill.
7. Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing PHI.

Paper Name: Design and Analysis of Algorithm
Paper Code: IT605A
Contracts: 3L
Credits: 4

Basic Tools on Designing Algorithms: 4L
What is an algorithm? Algorithm specification and performance analysis, randomized algorithms.

Divide-and-Conquer: 6L
The general method, application to binary search, finding the maximum and minimum, merge sort, quick sort, the problem of selection and Strassen's matrix multiplication.

The Greedy Method: 6L
The general method, application to optimal storage on tapes, job sequencing with deadlines, optimal merge patterns and minimum weight spanning trees.

Dynamic Programming: 10L
The general method, application to multistage graphs, all pairs shortest paths, optimal binary search trees,0/1-Knapsack and traveling salesman problem, Flow shop scheduling
Backtracking: The general method, application to 8- puzzle problem, 8- queen problem and sum of subsets.

Branch and Bound: 6L
The method, application to 0/1 Knapsack traveling salesman problems, and efficiency considerations.

NP-Hard and NP-Complete Problems: 8
Introduction and basic concepts, non-deterministic turing machine, the classes of P and NP, NP-hard graph problems, NP-completeness of the satisfiability problem, and polynomial- space-bounded problem.

Suggested Text / Reference Books:

Text Book:
1. E. Horowitz. et.al., Fundamentals of computer Algorithms, Galgotia Publication Pvt. Ltd., New Delhi,

Reference Books:
1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi,
2. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi,
3. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi,
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi -

Paper Name: Digital Image Processing
Paper Code: IT605B
Contracts: 3L
Credits: 4

DIGITAL IMAGE FUNDAMENTALS 8L
Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, Mach Band effect, Image sampling, Quantization, Dither, Two dimensional mathematical preliminaries.

IMAGE TRANSFORMS 8L
1D DFT, 2D transforms - DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Wavelet transform.

IMAGE ENHANCEMENT AND RESTORATION 8L
Histogram modification, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic and Yp mean filters . Design of 2D FIR filters. Image restoration - degradation model, Unconstrained and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations, Gray Level interpolation

IMAGE SEGMENTATION AND RECOGNITION 8L
Image segmentation - Edge detection, Edge linking and boundary detection, Region growing, Region splitting and Merging, Image Recognition - Patterns and pattern classes, Matching by minimum distance classifier, Matching by correlation.Neural networks-Backpropagation network and training, Neural network to recognize shapes.

IMAGE COMPRESSION 8L
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Block Truncation Coding, Transform coding, JPEG standard, JPEG 2000, EZW, SPIHT, MPEG.

Suggested Text / Reference Books:

TEXT BOOKS

1. Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education

REFERENCES

2. William K Pratt, Digital Image Processing John Willey
3. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy
4. A.K. Jain, PHI, New Delhi -Fundamentals of Digital Image Processing.
5. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India,

Paper Name: Advanced Operating System
Paper Code: IT605C
Contracts: 3L
Credits: 4

Introduction to Distributed System [2L]
Introduction, Examples of distributed system, Resource sharing, Goals of distributed system, hardware and software Concepts, design issues, Challenges.

Operating System Structures: [3L]
Review of structures: monolithic kernel, layered systems, virtual machines. Process based models and client server architecture; The micro-kernel based client-server approach.

Communication [4L]
Inter-process communication, Remote Procedure Call, Remote Object Invocation, Tasks and Threads. Examples from LINUX, Solaris 2 and Windows NT.

Theoretical Foundations: [2L]
Introduction. Inherent Limitations of distributed Systems. Lamport's Logical clock. Global State

Distributed Mutual Exclusion:[4L]
Classification of distributed mutual exclusion algorithm. NonToken based Algorithm:Lamport's algorithm, Ricart-Agrawala algorithm. Token based Algorithm: Suzuki-Kasami's broadcast algorithm.

Distributed Deadlock Detection: [5L]
Deadlock handling strategies in distributed systems. Control organizations for distributed deadlock detection. Centralized and Distributed deadlock detection algorithms: Completely Centralized algorithms, path pushing, edge chasing, global state detection algorithm.

Protection and Security: [4L]
Requirements for protection and security regimes. The access matrix model of protection. System and user modes, rings of protection, access lists, capabilities. User authentication, passwords and signatures. Use of single key and public key encryption.

Distributed file systems: [6L]
Issues in the design of distributed file systems: naming, transparency, update semantics and fault resilience. Use of the Virtual File System layer. Examples of distributed systems including Sun NFS, the Andrew file store, CODA file system and OSF DCE.

Distributed Shared Memory: [4L]
Architecture and motivations. Algorithms for implementing DSM. Memory Coherence

CORBA: [3L]
The Common Object Request Broker Architecture model and software and its relationship to Operating Systems.

Real Time Operating System [4L]
Introduction, Definition and Application, Basic model, Characteristics, Types of real time tasks, Timing Constraints, Modeling Timing Constraints,

Suggested Text / Reference Books:

TEXTBOOKS:

1. *Distributed Systems: Principles and Paradigms.* Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, 2007.

REFERENCES

2. *Operating Systems Internals and Design Principle,* William Stallings, Prentice Hall Publishers,
3. *Operating Systems Concepts,* A. Silberschatz and P. Galvin, Addison-Wesley
4. *Modern Operating Systems,* Andrew S. Tanenbaum, Prentice Hall or other undergraduate textbook.

Paper Name: System Software & Network Administration Lab/Networking II Lab
Paper Code: IT691
Contracts: 3L
Credits: 2

S.No Experiment

1. Study of different types of Network cables and practically implement the Cross-wired cable and straight through cable using clamping tool.
1. Study of Network Devices in Detail.
2. Study of network IP.
3. Connect the computers in Local Area Network.
4. Study of basic network command and Network configuration commands.
5. Configure a Network topology using packet tracer software.
6. Configure a Network topology using packet tracer software.
7. Configure a Network using Distance Vector Routing protocol.
8. Configure Network using Link State Vector Routing protocol

Paper Name: Web Technology Lab (Advance Java & J2EE Lab)
Paper Code: IT692
Contracts: 3L
Credits: 2

1. Assignments involving client side programming using HTML, Java Applet etc.
2. Assignments on programming using scripting languages such as JavaScript
3. Assignments involving server side programming using JSP, Servlet etc.
4. Assignments on Enterprise Application Development using JavaBeans, EJB.
5. Assignments involving SOA & Cloud Computing.

Suggested Text / Reference Books:

Reference Books:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent Learning Solutions INC.

Paper Name: Soft Computing Lab
Paper Code: IT693
Contracts: 3L
Credits: 2

1) a) Write a Matlab program (m.file) to calculate union, intersection, complement and difference of two fuzzy sets.
b) Write a Matlab program (m.file) to calculate the Demorgan's Law.
2) Find whether the given matrix is (a) reflexive (b) tolerance and (c) transitivity matrix or not.
3) Find whether the given matrix is symmetry or not by aMatlab program.
4) Find the fuzzy relation between two vectors *R* and *S* Using max–product and max-min method by a Matlab program
5) (a)Use Matlab command line commands to display the Gaussian membership function. Given x = 0–10 with increment of 0.1 and Gaussian function is defined between 0.5 and −5.
(b) Use Matlab command line commands to display the triangular membership function. Given x = 0–10 with increment of 0.2 triangular membership function is defined between [3 4 5]
6) Illustrate different types of generalized bell membership functions using Matlab program
(7) Using Matlab program find the crisp lambda cut set relations for λ = 0.2, the fuzzy matrix is given by
R=

0.2	0.7	0.8	1
1	0.9	0.5	0.1
0	0.8	1	0.6
0.	0.4	1	0.3

(8) Temperature control of the reactor where the error and change in error is given to the controller. Here the temperature of the reactor is controlled by the temperature bath around the reactor thus the temperature is controlled by controlling the flow of the coolant into the reactor. Form the membership function and the rule base using FIS editor.
(9) Consider the water tank with following rules
1. IF (level is okay) THEN (valve is no_change) (1)
2. IF (level is low) THEN (valve is open_fast) (1)
3. IF (level is high) THEN (valve is close_fast) (1)
Using Mamdani method and max–min method for fuzzification and method of centroid for defuzzification method construct a FIS. Before editing that rules, membership functions must be defined with membership function editor.

(10) (a) Form a fuzzy system, which approximates function f, when $x \in [-10, 10]$.Repeat the same by adding random, normally distributed noise with zero mean and unit variance.
(b) Simulate the output when the input is sin(t). Observe what happens to the signal shape at the output.

(11) Use Matlab's Fuzzy Logic Toolbox to model the tip given after a dinner for two, where the food can be disgusting, not good, bland, satisfying, good, or delightful, and the service can be poor, average, or good. To get started, you type fuzzy in a Matlab window. Then use the fuzzy inference system and membership function editors to define and tune your rules.

PART B (Neural Network)

12. Design networks of McCulloch-Pitts neurons that implement logical NOT, AND and OR gates. Draw each network and label all the weight and threshold values.

13. Derive expressions for the weights and thresholds of a McCulloch-Pitts neuron that can compute the following input-output mappings:

in1	*in2*	*out*
0	0	1
0	1	0
1	0	0
1	1	0

Write Matlab code for the above ANN.

14 Investigation the use of back-propagation learning using a sigmoidal nonlinearity to achieve one-to-one mapping, as described here:

1. $f(x) = 1/x$, $1 \le x \le 100$
2. $f(x) = \log_{10}x$, $1 \le x \le 10$
3. $f(x) = \exp(-x)$, $1 \le x \le 10$
4. $f(x) = \sin x$, $0 \le x \le \pi/2$

for each mapping, do the following:

(a) Set up two sets of data, one for network training, and the other for testing.
(b) Use the training data set compute the synaptic weights of the network, assumed to have a single hidden layer.
(c) Evaluate the computation accuracy of the network by using the test data. Use a single layer but with a variable number of hidden neurons. Investigate how the network performance is affected by varying the size of the hidden layer.

Paper Name: Multimedia Technology Lab
Paper Code: IT694
Contracts: 3L
Credits: 2

1. Sound capturing & editing using tools like SOUNDFORGE
2. Image editing using tools like Adobe Photoshop
3. Creating/editing motion video/animation clips (using tools like Flash / Adobe Premier)
4. Creation of Content using HTML (basic tags, table form, frame, link to other Image)
5. Creating stylesheet using DHTML
6. Home Page creation using HTML, DHTML

Suggested Text / Reference Books

1. Adobe , Adobe Photoshop 6.0: Classroom in a book Pearson Ed.
2. Anushka Wirasinha , Flash in a Flash- Web Development , PHI
3. Macromedia Flash5 fast and easy Web Development, Design, PHI
4. Castro, HTML4 for the World Wide Web, Pearson Ed.
5. Schurman & Purdi , Dynamic HTML in Action, Second Edition , PHI
6. Lozano, Multimedia- Sound & Video , PHI

Paper Name: Foreign Language Lab
(Japanese/French/German/Spanish)
Paper Code: HU691
Contracts: 3L
Credits: 2

Under Constructions

B. Tech in Information Technology
4^{th} Year - Semester 7

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
IT701	E-Commerce & ERP	3	1	0	4	30	70	100
IT702	Mobile Communication	3	1	0	4	30	70	100
IT703	A. Cloud Computing & SOA B. Computer Vision & Pattern Recognition C. Compiler Design	3	0	0	3	30	70	100
IT704	A. VLSI Design B. Robotics C. Bioinformatics & DNA Computing	3	0	0	3	30	70	100
IT791	E-Commerce & ERP Lab	0	0	3	2	40	60	100
IT792	C# and .NET Framework Lab	0	0	3	2	40	60	100
IT781	Minor Project	0	0	3	4	40	60	100
IT782	Technical Report Writing and Presentation on Industrial Training-III (4 Weeks Duration)	0	0	0	2	0	50	50
HU783	General Proficiency-III (Group discussion ,Soft Skill & Personality Development)	0	0	3	2	0	50	50
	Total	12	2	15	26	240	560	800
MC783	Professional Certification Program III	0	0	0	MANDATORY COURSE			

B. Tech in Information Technology
4th Year - Semester 7

Paper Name: E-Commerce & ERP
Paper Code: IT-701
Contact: 3L+1T
Credit: 4

Introduction to E-Commerce [3L]
Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

Business to Business E-Commerce [7L]
Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce. Business models for E-commerce, Business Process Re-Engineering.

Legal issues [5L]
Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Security Issues [7L]
Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security, Search engines, Intelligent agents in E-Commerce Electronic payment systems, E-security, Mobile commerce.

Business to Consumer E-Commerce and E-Business [8L]
Consumer trade transaction, Web metrics, Elements of E-Commerce, Industry impacts of E-business. Integrating Intranet and internet web applications across multiple networks. Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

ERP [9L]
The evolution of ERP systems, Business processes supported by ERP systems, The evolution of ERP systems architecture, Enterprise Perspective, Resource Management Perspective, Information System Perspective, Key Managerial Issues, OLAP, E-SCM and E-CRM.

Suggested Text / Reference Books:

1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. Handbook on Electronic Commerce, Shaw et al., Springer publication.

3. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
4. Applied E-Commerce, Langer, John Wiley Publication.
5. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
6. Global Electronic Commerce- Theory and Case Studies by J. Christopher Westland and Theodore H. K Clark, University Press.
7. Enterprise Resource Planning – A Managerial Perspective by D P Goyal, Tata McGraw Hill Education, 2011

Paper Name: Mobile Communications
Paper Code: IT 702
Contact: 3L+1T
Credit: 4

A General Overview [2L]: History, Transmission Medium, Need, Advantages, Disadvantages

Introduction to Personal Communications Services (PCS) [5L]: PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling.
General Packet Radio Services (GPRS) [2L]: GPRS Architecture, GPRS Network Nodes.

Wireless LANs [6L]: Characteristics, IEEE 802.11: Architecture, Physical Layer, MAC Layer, And MAC Management, 802.11a and 802.11b. HIPERLAN: History, WATM, BRAN and HiperLAN2.
Bluetooth: Architecture, Radio Layer, Baseband Layer, Link Management Protocol, L2CAP and Security.

Mobile Transport and Network Layer [12L]: Introduction, Traditional TCP: Congestion Control, Slow Start, Fast Retransmit and Implications of Mobility. Classical TCP Improvements: Indirect TCP, SnoopingTCP, Mobile TCP and Fast Retransmit. Mobile IP: Introduction, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations and Reverse Tunneling. Mobile Ad-hocNetworks: Routing, Destination Sequence Distance Vector, Dynamic Source Routing and Alternative Metrics.

Cellular Networks [9L]: Cellular Concept, Frequency Reuse, Channel Allocation Management, Call Setup, Location Management, Cell Handoffs, Interference: Co-channel and Adjacent Interference. System Capacity, Improving Cell Capacity and Coverage: Cell Splitting, Sectoring, Repeaters and Microcell ZoneConcept Wireless Application Protocol (WAP) [4L]: The Mobile Internet standard, WAP Gateway and Protocols,

Suggested Text / Reference Books:

Books:

1. J. Schiller, Mobile Communications, Addison –Wesley, 2003
2. T. S. Rapport, Wireless Communications, Principle and Practices
3. Forouzan, Data Communications and Networking, TMH

Paper Name: Cloud Computing
Paper Code: Code: IT 703A
Contacts: 3L
Credits: 3
Allocated Hrs: 40Hrs

Overview of Computing Paradigm [3L]
Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing Evolution of cloud computingBusiness driver for adopting cloud computing

Introduction to Cloud Computing[3L]
Cloud Computing (NIST Model)Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers Properties, Characteristics And DisadvantagesPros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing Role of Open Standards

Cloud Computing Architecture[4L]
Cloud computing stackComparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services Service Models (XaaS) Infrastructure as a Service(IaaS) Platform as a Service(PaaS) Software as a Service(SaaS) Deployment Models Public cloud Private cloud Hybrid cloud Community cloud

Infrastructure as a Service(IaaS)[4L]
Introduction to IaaSIaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM) Resource Virtualization Server Storage NetworkVirtual Machine(resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service) Examples Amazon EC2Renting, EC2 Compute Unit, Platform and Storage, pricing, customers Eucalyptus

Platform as a Service(PaaS)[3L]
Introduction to PaaSWhat is PaaS, Service Oriented Architecture (SOA) Cloud Platform and Management Computation Storage Examples Google App Engine Microsoft Azure SalesForce.comâ ™s Force.com platform

Software as a Service(PaaS)[4L]
Introduction to SaaS Web services Web 2.0 Web OS Case Study on SaaS

Service Management in Cloud Computing[5L]
Service Level Agreements(SLAs) Billing And Accounting Comparing Scaling Hardware: Traditional vs. Cloud Economics of scaling: Benefitting enormously Managing Data Looking at Data, Scalability And Cloud Services Database And Data Stores in Cloud Large Scale Data Processing

Cloud Security[5L]
Infrastructure SecurityNetwork level security, Host level security, Application level security Data security and StorageData privacy and security Issues, Jurisdictional issues raised by Data location Identity And Access Management Access Control Trust, Reputation, Risk Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

Case Study on Open Source And Commercial Clouds[9L]
Eucalyptus Microsoft Azure Amazon EC2

Suggested Text / Reference Books:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

Paper Name: Pattern Recognition

Paper Code: IT 703B
Contacts: 3L
Credits: 3

Introduction to Pattern Recognition [2L]

Tree Classifiers Getting our feet wet with real classifiers [3L]
(a) Decision Trees: CART, C4.5, ID3. (b) Random Forests

Bayesian Decision Theory [2L]

Linear Discriminants Discriminative Classifiers: the Decision Boundary[3L]
(a) Separability (b) Perceptrons (c) Support Vector Machines

Parametric Techniques Generative Methods grounded in Bayesian Decision Theory [3L]
(a) Maximum Likelihood Estimation (b) Bayesian Parameter Estimation (c) Sufficient Statistics

Non-Parametric Technique [3L]
(a) Kernel Density Estimators (b) Parzen Window (c) Nearest Neighbor Methods

Unsupervised Methods Exploring the Data for Latent Structure [7L]
(a) Component Analysis and Dimension Reduction

i. The Curse of Dimensionality ii. Principal Component Analysis
iii. Fisher Linear Discriminant iv. Locally Linear Embedding
(b) Clustering
i. K-Means ii. Expectation Maximization iii. Mean Shift

Classifier Ensembles [3L]
(a) Bagging (b) Boosting / AdaBoost

Graphical Models The Modern Language of Pattern Recognition and Machine Learning [7L]
(a) Introductory ideas and relation back to earlier topics (b) Bayesian Networks
(c) Sequential Models
i. State-Space Models ii. Hidden Markov Models iii. Dynamic Bayesian Networks

Theoretical Treatments in the Context of Learned Tools [4L]
(a) No Free Lunch Theorem (b) Ugly Duckling Theorem (c) Bias-Variance Dilemma
(d) Jacknife and Bootstrap Methods

Other Items Time Permitting [2L]
(a) Syntactic Methods (b) Neural Networks

Suggested Text / Reference Books:

1. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, John Wiley, 2001
2. Pattern Recognition, S.Theodoridis and K.Koutroumbas, 4th Ed., Academic Press, 2009
3. Pattern Recognition and Machine Learning, C.M.Bishop, Springer, 2006

Paper Name: Compiler Design
Paper Code: IT-703C
Contacts: 3L
Credits: 3

Introduction to Compiling [3L]
Compilers, Analysis of the source program, The phases of the compiler, Cousins of the compiler.

Lexical Analysis [6L]
The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a tokens, Finite automata, From a regular expression to an NFA, From a regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer generator (Lex).

Syntax Analysis [9L]
The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non-recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.

Syntax directed translation [5L]
Syntax director definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.

Type checking [4L]
Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions.

Run time environments [5L]
Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.

Intermediate code generation [4L]
Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).

Code optimization [5L]
Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representation of basic blocks, The principle sources of optimization, Loops in flow graph, Peephole optimization.

Code generations [4L]
Issues in the design of code generator, a simple code generator, Register allocation & assignment.

Suggested Text / Reference Books:

1. Aho, Sethi, Ullman - “Compiler Principles, Techniques and Tools” - Pearson Education.
2. Holub - “Compiler Design in C” - PHI.

Paper Name: VLSI Design
Paper Code: IT-704A
Contacts: 3L
Credits: 3

Module 1: [6L]
Introduction to VLSI Design: VLSI Design Concepts, Moor's Law,
Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical), Y-Chart, Digital VLSI Design Steps.

MOS structure: E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flat-band voltage, Potential balance & Charge balance, Inversion, MOS capacitances.

Module 2: [10L]
Micro-electronic Processes for VLSI Fabrication: Silicon Semiconductor Technology- An

Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion, Cleaning, Etching, Photo-lithography – Positive & Negative photo-resist
Basic CMOS Technology – (Steps in fabricating CMOS), Basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator
Layout Design Rule: Stick diagram with examples, Layout rules.

Module 3:[10L]
Three Terminal MOS Structure: Body effect.
Four Terminal MOS Transistor: Drain current, I-V Characteristics. Current-voltage equations (simple derivation).
Scaling in MOSFET: Short Channel Effects, General scaling, Constant Voltage & Field scaling.
CMOS: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate using CMOS.

Module 4: [10L]
Hardware Description Language – VHDL or Verilog Combinational & Sequential Logic circuit Design.

Suggested Text / Reference Books:

1. CMOS Digital Integrated Circuit, S.M.Kang & Y.Leblebici, TMH.
2. Modern VLSI Design, Wayne Wolf, Pearson Education.
3. VHDL, Bhaskar, PHI.
4. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.
5. Advance Digital Design Using Verilog , Michel D. Celliti, PHI

Paper Name: Computer Vision and Robotics
Paper Code: IT-704B
Contacts: 3L
Credits: 3

Module 1[3L]
Image formation and Image model-Components of a vision system-Cameras-Radiometry-Light in space-Light in surface- sources, shadows and shading, Color-Human color perception-Representation of color- A model for image color-Surface color from image color

Module 2[3L]
Early vision-Linear Filters and Convolution-Shift variant Linear system- Spatial Frequency and Fourier Transforms-Samoling and Aliasing-Filters as Templates-Normalized co relation and finding patterns-Edge detection-Texture Representation ,Analysis and Application

Module 3 [4L]
Multiple images-The Geometry of multiple views-Stereopsis-Affine structure from motion-
Elements of Affine Geometry-Affine structure and motion from two images-Affine structure and motion from multiple images-From Affine to Euclidean images.

Module 4 [5L]
Middle level vision-Segmentation by clustering-Shot Boundary Detection and Background Subtraction-Image segmentation by clustering pixels-Segmentation by Graph-Theoretic clustering-Segmentation by fitting a model-The Hough Transform-Fitting lines-Fitting curves- Fitting as a probabilistic inference problem-Robustness-Segmentation and fitting using probabilistic methods.

Module 5 [4L]
High level vision-:Geometric methods-Model based vision-Obtaining hypothesis by pose consistency, pose clustering and using Invariants- Verification-smooth surface and their outlines-Aspect graphs- Range data-Range Data segmentation- Range image Registration and model acquisition-Object Recognition.

Module 6 [2L]
Introduction -- brief history, types, classification and usage, Science and Technology of robots, Some useful websites, textbooks and research journals.

Module 7 [6L]
Elements of robots – links, joints, actuators, and sensors
Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.

Module 7 [5L]
Kinematics of serial and parallel robots
Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.

Module 8 [3L]
Velocity and static analysis of robot manipulators
Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom,

Module 9 [3L]
Dynamics of serial and parallel manipulators
Mass and inertia of links, Lagrangian formulation for equations of motion for serial and parallel

manipulators, Generation of symbolic equations of motion using a computer, Simulation (direct and inverse) of dynamic equations of motion, Examples of a planar 2R and four-bar mechanism, Recursive dynamics,

Module 10 [3L]

Motion planning and control

Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.

Module 11 [4L]

Control considerations, Hardware Architecture, Hardware for joint controllers, Computational Speed, Robot Language, Robot Programming.

Suggested Text / Reference Books:

1. Computer vision – A modern Approach , David A forsyth & Jean ponce , Prentice Hall ,2002.
2. "Computer vision and Applications" , Bernd Jahne and Horst HauBecker Academic press ,2000.
3. K.S Fu R.C . CSG Lee-Robotics Control,Sensing, Vision & Intelligence,McGraw-Hill.
4. M.P. Groover, M.Weins,R.N. Nagel,N.C. Odrey –Industrial Robotics,McGraw Hill
5. Andrew C. Straugard-Robotics & AI,PHI
6. S.Sitharama Iyengar, Alberto Elefes -Autonomous Mobile Robots Control,Planning & Achitecture,IEEE Computer Society Press

Paper Name: Bioinformatics & DNA Computing
Paper Code: IT704C
Contacts: 3L
Credits- 3

MODULE 1: INTRODUCTION TO CELLULAR BIOLOGY 3L

Concepts of Cell, types of cell, components of cell, organelle. Functions of different organelles.

MODULE 2: THE CENTRAL DOGMA 9L

Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept. Concepts of RNA: Basic structure, Difference between RNA and DNA. Types of RNA.

Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Translation Introduction to Metabolic Pathways.

MODULE 3: BIOINFORMATICS DATABASES 3L

Introduction to Bioinformatics. Recent challenges in Bioinformatics. Data Warehouse, Data models, Database Management Concepts. Different Bioinformatics database types. Protein Sequence Databases: PDB, SWISS-PROT database. DNA sequence databases: DDBJ, GenBank.

MODULE 4: BIOINFORMATICS SEARCH ENGINES 3L
Sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank; OMIM, Taxonomy browser, PubMed.

MODULE 5: DNA SEQUENCE ANALYSIS AND DATA VISUALIZATION 12L
DNA Mapping and Assembly: Size of Human DNA, Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules. DeBruijn Graph. Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignments, Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.

MODULE 6: INTRODUCTION PROBABILISTIC MODELS USED IN COMPUTATIONAL BIOLOGY 9L
Probabilistic Models; Hidden Markov Model: Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bioinformatics: Gene finding, profile searches, multiple sequence alignment and regulatory site identification. Bayesian networks Model: Architecture, Principle, Application in Bioinformatics.

MODULE 7: BIOLOGICAL DATA CLASSIFICATION AND CLUSTERING 6L
Assigning protein function and predicting splice sites: Decision Tree

Suggested Text / Reference Books:

1. Bioinformatics and Molecular Evolution Paul G. Higgs and Teresa K. Attwood
2. Bioinformatics Computing By Bryan Bergeron
3. BIOINFORMATICS AND FUNCTIONAL GENOMICS Jonathan Pevsner
4. GENE CLONING AND DNA ANALYSIS T.A. BROWN

Paper Name: E Commerce Lab
Paper Code: IT791
Contracts: 3L
Credits- 2

Following E-Commerce experiments are to be implemented using either VB, ASP, SQL or JAVA, JSP, SQL.
• Creating E-Commerce Site [3P]: Designing and maintaining WebPages. Advertising in the Website, Portals and Vortals.
E-Commerce Interaction [6P]: Comparison Shopping in B2C, Exchanges Handling in B2B, Interaction Examples: Virtual Shopping Carts.
• E-Commerce Applications [6P]: Online Store, Online Banking, Credit Card Transaction Processing.

Suggested Text / Reference Books:

1. E-Commerce through ASP by W Clarke- BPB
2. Beginning E-Commerce with VB, ASP, SQL Server 7.0 & MTS by Mathew Reynolds, Wrox Publishers
3. Professional Java Server Programming J2EE 1.3 Edition By Allamaraju et al, SPD.

Paper Name: C# and .NET Framework Lab
Paper Code: IT792
Contracts: 3L
Credits- 2

C#.NET:
- OOPs Concept
- Variables, Datatypes and Type System
- Loops
- Classes and Objects
- Inheritance
- Polymorphism
- Abstraction and Encapsulation
- Generics
- Null Coalesce Operator and Nullable Types
- Anonymous Types
- Properties
- Anonymous methods and Partial methods
- Delegates and Events
- Attributes and Reflection

Suggested Text / Reference Books:

1. Writing Solid Code - Steve Maguire
2. Mythical Man-Month - Frederick P. Brooks Jr

3. Code Complete - Steve McConnell
4. The Art of Computer Programming - Knuth
5. Algorithms - Robert Sedgewick
6. Debugging Applications - John Robbins
7. Taligent's Guide to Designing Programs - Taligent
8. Design Patterns - Gamma, Helm, Johnson, Vlissides

B. Tech in Information Technology

4th Year - Semester 8

Paper code	Name of the subjects	Periods			Credits	Marks		
		L	T	P		IE	FE	Total Marks
HU801	Industrial Management	3	1	0	2	30	70	100
IT801	Internetworking Technologies	3	1	0	3	30	70	100
IT802	A. Data Mining and Warehousing B. Real Time and Embedded Systems C. Building Enterprise Applications	3	0	0	3	30	70	100
IT803	A. Network Security & Cryptography B. Natural Language Processing C Remote Sensing and GIS	3	0	0	3	30	70	100
IT891	Software Testing Lab	0	0	3	2	40	60	100
IT892	Mobile Application Development Lab	0	0	3	2	40	60	100
IT881	Major Project	0	0	6	8	40	60	100
IT882	Grand Viva	0	0	0	2		100	100
MC881	General proficiency-IV (Practice Session for GRE,TOEFLE,CAT,MAT,GMAT etc.)	0	0	3	MANDATORY COURSE			
	Total	12	2	15	25	240	560	800

B. Tech in Information Technology
4th Year - Semester 8

Paper Name: Industrial Management
Paper Code: HU 801
Contacts: 3L +1T
Credits: 4

Engineering/Technology Management:[4L]
objectives and functions of management, general and scientific management, strategic management, historical development and functions of engineering/technology management.

Quality Management: [10L]
Concept, Dimensions for goods and services, Cost of Quality, Statistical Quality Control, Control Charts, Acceptance Sampling (single).
Total Quality Management: Concept, benefits, Criticism.
New Quality Tools: Kaizen, Six Sigma, Quality Circles.
Productions Management: [10L]
Concept. Difference from Operations Management, Types of Production(Mass, Batch, Project), Functions of Production Management.
Productivity: Concept, Different Inputs and Productivity Measures, Efficiency and Effectiveness, Measures to increase Productivity.
Organizational Behavior: [8L]
Different Schools of Management Thought : Scientific Management, Administrative Theory, Theory of Bureaucracy, Human Relations Theory(Elton Mayo).
Motivation: Concept, Different Theories (Maslow, ERG, Herzberg,)
Communication: Purpose, process, Barriers to effective communication, Guidelines to make communication effective.
Perception: Process, Importance, Factors influencing perception, Shortcuts for judging people- Halo effect, Stereotyping, Projection.
Inventory Management:[7L]
Objectives of Inventory management, Levels of stock, Wilson EOQ model, EOQ model with discount, EOQ model with shortage, EOQ with Replenishment. ABC analysis, FSN analysis, VED analysis

Suggested Text / Reference Books

1. Industrial Management, Vol.1 L.C. Jhamb, EPH
2. Industrial Relations, Trade Unions & Labour Legislation - Sinha, Pearson Education Asia
3. Organizational Behaviour, S.P. Robbins, Prentice Hall
4. Productions and Operations Management, S. N. Chary, TMH
5. Productions and Operations Management, Joseph Monks,TMH

Paper Name: Internetworking Technologies
Paper Code: IT801
Contacts: 3L +1T
Credits: 4

An Overview on Internet [4L] :
The need for an Internet, The TCP/IP Internet, Internet services, Internet protocols and standardization, Review of Network technologies. Internetworking Concepts [6L] : Architectural model introduction, Application level interconnection, Network level interconnection, Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet.

Internet Address [5L] :
Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format,Transport Gateways and subnet addressing, Multicast addressing.

Internet Protocol [6L]:
Internet Architecture and Philosophy, The concept of unreliable delivery, Connectionless delivery system, The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).

Routing [7L] :
The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to Gateway Protocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.

Enterprise Networking [7L] :
Corporate networking, Broadband at the Metropolitan area level, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Frame relay technology and services, Virtual private network concepts PPTP protocol.
Internet Servers [4L] :
DNS, DHCP Servers, FTP, TELNET, E-Mail
Firewall & Networking [6L] : Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.

Suggested Text / Reference Books:

1. Computer Networks and Internets - Douglas E. Comer; PE.
2. Communication Networks - Leon-Garcia-Widjaja; TMH.
3. Internetworking with TCP / IP - Douglas E .Comer; PE.

4. TCP/IP protocol suite - Forouzan Behrouz A; TMH.
5. Computer Networks – Andrew S. Tanenbaum; PHI.
6. Data and Computer Communication - William Stallings; PHI.
7. The Complete reference of Networking - Craig Zacker; TMH.

Paper Name: Data Mining & Warehousing
Paper Code: IT802A
Contacts: 3L
Credits- 3

Introduction : [2L]
Data warehousing – definitions and characteristics, Multi-dimensional data model, Warehouse schema.

Data Marts: [4L]
Data marts, types of data marts, loading a data mart, metadata, data model, maintenance, nature of data, software components; external data, reference data, performance issues, monitoring requirements and security in a data mart.

Online Analytical Processing : [4L]
OLTP and OLAP systems, Data Modeling, LAP tools, State of the market, Arbor Essbase web, Microstrategy DSS web, Brio Technology, star schema for multi-dimensional view, snowflake schema; OLAP tools.

Developing a Data Warehousing: [4L]
Building of a Data Warehousing, Architectural strategies & organizational issues, design considerations, data content, distribution of data, Tools for Data Warehousing.

Data Mining: [4L]
Definitions; KDD(Knowledge Discovery database) versus Data Mining; DBMS versus Data Mining, Data Mining Techniques; Issues and challenges; Applications of Data Warehousing & Data mining in Government.

Association Rules: [4L]
A priori algorithm, Partition algorithm, Dynamic inset counting algorithm, FP – tree growth algorithm; Generalized association rule. Clustering Techniques: Clustering paradigm, Partition algorithms, CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; Categorical clustering, STIRR, ROCK, CACTUS.

Decision Trees: [4L]
Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with pre-sorting.

Web Mining: [5L]
Web content Mining, Web structure Mining, Web usage Mining, Text Mining.
Temporal and Spatial Data Mining: Basic concepts of temporal data Mining, The GSP algorithm, SPADE, SPIRIT, WUM.

Suggested Text / Reference Books:

Texts:
1. Data Warehousing Fundamentals for IT Professionals, Second Edition by Paulraj Ponniah, Wiley India.
2. Data Warehousing –Concepts, Techniques, products, application; Prabhu; PHI.
3. Data Mining Techniques; A. K. Pujari; Universities Press.

References:
1. Data Mining, Practical Machine Learning Tools and Techniques, Third Edition; Ian H. Witten, Eibe Frank, Mark A. Hall
2. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and Stephen J. Smith, TataMcGraw Hill Education
3. Data warehouse Toolkit by Ralph Kimball, Wiley India
4. Data Warehousing in the real world; Anahory; Pearson Education.
5. Data Mining Introductory & Advanced Topic; Dunham; Pearson Education.

Paper Name: Real Time and Embedded Systems
Paper Code: IT802B
Contacts: 3L
Credits- 3

Introduction:
Definition, Classification and Characterization; Challenges for Embedded Systems; Exemplary Embedded System.
Hardware Overview: Terminologies; Fundamental Components.

Interrupt & Interrupt Routines: Interrupt Basics; Shared Data between Interrupt Routines and Main Program; Interrupt Latency.

Real-Time Operating Systems: Introduction; Real-Time Operating system architecture; Task & Task States; Semaphore and Shared Data; Message Queue, Mailbox & Pipes; Timer & Events; Memory & Interrupt Management in RTOS environment.

Design Consideration: Encapsulating Semaphores and Queues; Saving Memory & Power; Hard Real-Time Scheduling Considerations; Scheduling Real-Time Tasks in Multiprocessors and Distributed Systems; Hardware Software Co-Design in an Embedded Systems.

Commercial Real-Time Operating Systems: Unix or Windows as Real-Time Operating Systems; Real-Time POSIX Standard; A survey of Real-Time Operating Systems- PSOS, VRTX, VxWorks, QNX, microC/OS-II, RT Linux, Lynx, Windows CE.

Development Tools For Embedded Systems: Host and Target Machines; Compilers, Linker & Locaters; Transferring Firmware into the Target Systems; Debugging in Host Machine & Target Machines.

Real-Time & Embedded Systems Case Study: Smart Card (SOC-System On Chip); Digital Camera; Mobile Phones.

Suggested Text / Reference Books:

Texts:
1. Computers and Components, Wayne Wolf, Elseveir.
2. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

References:
1. Embedding system building blocks, Labrosse, via CMP publishers.
2. Embedded Systems, Raj Kamal, TMH.
3. Micro Controllers, Ajay V Deshmukhi, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
5. Microcontrollers, Raj kamal, Pearson Education.
6. An Embedded Software Primer, David E. Simon, Pearson Education.

Paper Name: Building Enterprise Applications
Paper Code: IT802C
Contacts: 3L
Credit: 3

Unit I: 3L
Introduction to enterprise applications and their types, software engineering methodologies, life cycle of raising an enterprise application, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications

Unit II: 6L
Inception of enterprise applications, enterprise analysis, business modeling, requirements elicitation, use case modeling, prototyping, non functional requirements, requirements validation, planning and estimation

Unit III: 12L
Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical

architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design.

Unit IV: 9L
Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage

Unit V: 6L
Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application.

Suggested Text / Reference Books:

1, Martin Fowler, "Patterns of Enterprise application Architecture'- Pearson.
2. Gamma et al, 'Design patterns : elements of reusable object-oriented software', Addison Wesley

Paper Name: Natural Language Processing
Paper Code: IT803B
Contacts: 3L
Credit: 3

Module I 5L
Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art and the Near-Term Future.
Regular Expressions and Automata: Regular Expressions, Finite-State Automata, Regular Languages and FSAs.

Module II 5L
Word Classes and Part-of –Speech Tagging: (Mostly) English Word Classes, Tagsets for English, Part-of –Speech Tagging, Rule-Based Part-of –Speech Tagging, Stochastic Part-of –Speech Tagging, Transformation-Based Tagging, Other Issues.

Module III 6L
Context-Free Grammars for English: Constituency, Context-Free Rules and Trees, Sentences-

Level Constructions, The Noun Phrase, Coordination, Agreement, The Verb Phrase and Subcategorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence and Normal Form, Finite-State and Context- Free Grammars, Grammars and Human Processing.

Module IV **6L**
Parsing with Context-Free Grammars: Parsing as Search, A Basic Top-Down Parser, Problems with the Basic Top-Down Parser, The Early Algorithm, Finite – State Parsing Methods.

Module V **5L**
Features and Unification: Feature Structures, Unification of Features Structures, Features Structures in the Grammar, Implementing Unification, Parsing with Unification Constraints, Types and Inheritance.

Module VI **6L**
Representing Meaning: Computational Desiderata for Representations, Meaning Structure of Language, First Order Predicate Calculus, Some Linguistically Relevant Concepts.
Semantic Analysis: Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Integrating Semantic Analysis into the Early Parser, Idioms and Composionality, Robust Semantic Analysis.

Module VII **9L**
Discourse: Reference Resolution, Text Coherence, Discourse Structure, Psycholinguistic Studies of Reference and Coherence.
Natural Language Generation: Introduction to Language Generation, An Architecture for Generation, Surface Realization, Discourse Planning, Other Issues.

Module VIII Markov Models

Suggested Text / Reference Books:

Text Book:
1. D.Jurafsky & J.H.Martin- Speech and Language Processing, 4th Edn, Pearson Education.

Reference Book:
1. J. Allen – Natural Language Understanding, Pearson Education, New Delhi.

Paper Name: Remote Sensing and GIS
Paper Code: IT803C
Contacts: 3L
Credit: 3

Introduction and Overview of Geographic Information Systems [4L]
Definition of a GIS, features and functions; why GIS is important; how GIS is applied; GIS as an

Information System; GIS and cartography; contributing and allied disciplines; GIS data feeds; historical development of GIS.

GIS and Maps, Map Projections and Coordinate Systems [4L]
Maps and their characteristics (selection, abstraction, scale, etc.); automated cartography versus GIS; map projections; coordinate systems; precision and error.

Data Sources, Data Input, Data Quality and Database Concepts [7L]
Major data feeds to GIS and their characteristics: maps, GPS, images, databases, commercial data; locating and evaluating data; data formats; data quality; metadata. Database concepts and components; flat files; relational database systems; data modeling; views of the database; normalization; databases and GIS.

Spatial Analysis [3L]
Questions a GIS can answer; GIS analytical functions; vector analysis including topological overlay; raster analysis; statistics; integrated spatial analysis.

Making Maps [6L]
Parts of a map; map functions in GIS; map design and map elements; choosing a map type; producing a map formats, plotters and media; online and CD-ROM distribution; interactive maps and the Web.

Implementing a GIS [5L]
Planning a GIS; requirements; pilot projects; case studies; data management; personnel and skill sets; costs and benefits; selecting a GIS package; professional GIS packages; desktop GIS; embedded GIS; public domain and low-cost packages.

Technology & Instruments involved in GIS & Remote Sensing [8L]
GIS applications; GIS application areas and user segments; creating custom GIS software applications; user interfaces; case studies. Future data; future hardware; future software; Object-oriented concepts and GIS; future issues – data ownership, privacy, education; GIS career options and how to pursue them.

Remote Sensing [8L]
Remote sensing of environment, E.M. Principle, Thermal infrared remote sensing, Remote sensing of Vegetation, Remote sensing of water, urban landscape

Suggested Text / Reference Books:
Texts:

1. “Principles of geographical information systems”, P. A. Burrough and R. A. Mcdonnel, Oxford.
2. “Remote sensing of the environment”, J. R. Jensen, Pearson

References:
1. "Exploring Geographic Information Systems", Nicholas Chrismas, John Wiley & Sons.
2. "Getting Started with Geographic Information Systems",Keith Clarke, PHI.
3. "An Introduction to Geographical Information Systems", Ian Heywood, Sarah Cornelius, and Steve Carver. Addison-Wesley Longman.

Paper Name: Software Testing Lab

Paper Code: IT891

Weekly Practical Hrs : 3

Credit : 2

1. Introduction to QUICK Test professional
2. RFT (Rational Functional Tester) tool usage
3. JUnit - Test Framework
4. log4j - Architecture
5. Selenium IDE, Automated testing Tool

Paper Name :Mobile Application Development Lab
Paper Code: IT892
Contacts : 3
Credit : 2

1. Simulation of application using J2ME simulator
   a. Midlet and other basic UI items.
   b. Bluetooth API
   c. Implementation of Wireless Messaging
   d. MMAPI
2. Simulation of applications to access web sites using Microsoft Windows Mobile .net environment.
3. Simulation of Implementation of playing games and photo sharing applications using BREW (Binary Runtime Environment for Wireless Toolkit)
4. Simulation of Infotainment (news, weather forecasts etc) using WAP
5. Simulation of applications using symbian OS