UNIVERSITY OF DELHI

NETAJI SUBHAS INSTITUTE OF TECHNOLOGY

CHOICE BASED CREDIT SYSTEM

SCHEME OF COURSES

FOR

Bachelor of Engineering

In

Information Technology

Passed in the meeting of Academic Council, University of Delhi, held on July 19, 2016

TABLE OF CONTENTS

PREAMBLE

I. INTRODUCTION

Higher education is very important for the growth and development of any country. It is a living organ and requires continuous changes to ensure the quality of education. National Knowledge Commission and University Grants Commission have recommended many academic reforms to address the challenges of today's networked globalized world. People are coming together with the help of new technologies which is resulting towards new aspirations, expectations, collaborations and associations. The concept of "work in isolation" may not be relevant and significant anymore. The UGC guidelines on adoption of Choice Based Credit System may be an important step to revamp the processes, systems and methodologies of Higher Educational Institutions (HEIs). The teacher centric mode be changed to learner centric mode. Class room teaching and learning be made effective; relevant and interesting. Concepts and theories be explained with examples, experimentation and related applications.

A culture of discussions, arguments, interpretations, counter-interpretations, re-interpretations, and opposing interpretations must be established. Research should not only be confined to redefinition, extension and incremental change. Innovation & creativity should become an epicenter for all research initiatives. The most important capital is the human capital and thus the ultimate objective is to develop good human beings with utmost integrity & professionalism for this new world.

The Choice Based Credit System supports the grading system which is considered to be better than conventional marks system. It is followed in many reputed institutions in India and abroad. The uniform grading system facilitates student mobility across the institutions within and across the countries and also enable potential employers to assess the performance of the students. The Choice Based Credit System makes the curriculum interdisciplinary and bridge the gap between professional and liberal education.

II. CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions have been moving from the conventional annual system to semester system. Currently many of the institutions have already introduced the choice based credit system. The semester system accelerates the teaching-learning process and enables vertical and horizontal

mobility in learning. The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. It is desirable that the HEIs move to CBCS and implement the grading system.

A. Programme Educational Objectives (PEOs)

This scheme and courses are related to four year Information Technology programme with following Programme Educational Objectives (PEO).

1. To provide in-depth knowledge and fundamentals to make IT professionals and in pursuit of higher studies.
2. To equip students with analytical and technical knowledge for solving real life problems with reliable IT solutions
3. To promote and enrich students through participation in various technical, non-technical and socio-economic events.
4. To make students aware of social issues, professional ethics and make them adaptable to different cultures.

B. Types of Courses

Courses are the subjects that comprise the Information Technology programme.

1. A course may be designed to comprise lectures, tutorials, laboratory work, field work, outreach activities, project work, vocational training, viva, seminars, term papers, assignments, presentations, self-study etc. or a combination of some of these components.

2. The learning objectives and learning outcomes of each course will be defined before the start of a semester.

3. Courses are of three kinds: Core, Elective and Foundation.

   i. **Core Course (CC)**: This is a course which is to be compulsorily studied by a student as a core requirement to complete the requirement of B.E. in Information Technology.

ii. **Elective Course**: An elective course is a course which can be chosen from a pool of subjects. It is intended to support the discipline of study by providing an expanded scope, enabling exposure to another discipline/ domain and nurturing a student's proficiency/skill. An elective may be of following types:

a) **Discipline Centric Elective (ED)**: It is an elective course that adds proficiency to the students in the discipline.

b) **Generic Elective (EG):** It is an elective course taken from other Engineering disciplines and enhances the generic proficiency and interdisciplinary perspective of students.

c) **Open Elective (EO):** It is an elective course taken from non-engineering disciplines that broadens the perspective of an Engineering student.

iii. **Foundation Course**: A Foundation course leads to knowledge enhancement and provides value based training. The Foundation Courses may be of two kinds:

a) **Compulsory Foundation (FC):** It is based upon content that leads to fundamental knowledge enhancement in sciences, humanities, social sciences and basic Engineering principles. They are mandatory for all disciplines.

b) **Elective Foundation (FE):** It can be taken from among a pool of foundation courses which aim at value-based education. They may provide hands-on-training to improve competencies and skills or provide education on human, societal, environmental and national values.

4. Each course contributes certain credits to the programme. A course can be offered either as a full course (4 credits) or as a half course (2 credits). A full course is conducted with 3 hours of lectures and either 1 hour of tutorial or 2 hours of practical work per week. A half course is conducted with 2 hours of lectures.

5. A student of undergraduate programme has to accumulate about 50% credits from the Core Courses; about 20% credits from the Foundation Courses; and the remaining credits from the Elective Courses to become eligible for the award of degree.

6. A course (full/half) may also be designed without lectures or tutorials. However, such courses may comprise Field work, Outreach activities, Sports, Project work, Vocational Training, Seminars, Self-study etc. or a combination of some of these.

7. A project work/dissertation is considered as a special course involving application of the knowledge gained during the course of study in exploring, analyzing and solving complex problems in real life applications. A candidate completes such a course with an advisory support by a faculty member.

8. Apart from the above courses, audit courses may be offered. They do not carry credits but aim at expanding knowledge or bridging deficiency in knowledge or skill.

C. Examination and Assessment

The following system will be implemented in awarding grades and CGPA under the CBCS system.

1. **Letter Grades and Grade Points:** A 10-point grading system shall be used with the letter grades as given in Table 1:

Table1: Grades and Grade Points

Letter Grade	Grade point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B (Above average)	6
C (Average)	5
P (Pass)	4
F (Fail)	0
Ab (Absent)	0

2. **Fail grade:** A student obtaining Grade F shall be considered fail and will be required to reappear in the examination. If the student does not want to reappear in an **elective course** (that is, EG, ED, EO, FE *but not* CC or FC courses) then he/she can re-register afresh for a new elective course

3. **Audit course:** For audit courses, 'Satisfactory' or 'Unsatisfactory' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

4. **Fairness in Assessment:** The CBCS promotes continuous evaluation system where the weightage of end semester examinations should not be more than 60%. The departments shall design its own methods for continuous evaluation. It shall have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching-learning methods. In this regard, checks and balances will be implemented to ensure fair and effective assessment and examination process.

5. **Computation of SGPA and CGPA:** The following procedure shall be used to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

   i. The SGPA is the ratio of sum of the product of the number of credits and the grade points scored in all the courses of a semester to the sum of the number of credits of all the courses taken by a student:

$$SGPA(S_i) = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

   Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

   ii. The CGPA is also calculated in the same manner taking into account all the courses taken by a student over all the semesters of a programme:

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

   where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

   iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

   iv. CGPA shall be converted into percentage of marks, if required by multiplying CGPA with 10.

III. PROGRAMME STRUCTURE

1. The B.E. Information Technology programme consists of 8 semesters, normally completed in 4 years. The total span period cannot exceed 7 years.

2. The courses offered in each semester are given in the *Semester-wise Course Allocation* scheme of B.E. Information Technology.

3. The courses under FC and common pool of electives offered for students of all disciplines under FE, EG and EO categories are listed under separate tables in the scheme. The discipline centric courses under CC and ED categories are listed separately.

4. A course may have pre-requisite course(s) that are given in the *Semester-wise Course Allocation scheme.*

5. A student can opt for a course only if he/she has successfully passed its pre-requisite(s).

6. A student has to register for all courses before the start of a semester.

7. After second year a student may register for courses leading to a minimum number of credits as prescribed in the scheme and a maximum of 28 credits. Normally a student registers for courses leading to 22 credits.

8. B.E. Information Technology programme consists of 176 credits. A student shall be awarded the degree if he / she has earned 168 or more credits.

IV. COURSE CODIFICATION

1. Programme Codes

The codes for various Undergraduate programmes are as follows:

i. Biotechnology: BT
ii. Computer Engineering: CE
iii. Electronics and Communication Engineering: EC
iv. Instrumentation and Control Engineering: IC
v. Information Technology: IT
vi. Manufacturing processes and Automation Engineering: MA
vii. Mechanical Engineering: ME

2. Departmental Course Codes

The codes for departmental core courses and discipline-specific electives are specific to each discipline. The first two characters are derived from departmental codes listed above. The third character is 'C' for core courses and 'D' for discipline-specific courses. This is followed by a 2-digit sequence number:

i. ITCyy: Core Course

ii. ITDyy: Discipline-centric Elective Course

3. Common Course Codes

The list for courses offered under Compulsory Foundation (FC), Foundation Electives (FE) and Open Electives (EO) will follow a common code as shown below. The 3-digit sequence number 'yyy' is taken from the respective tables of different types of courses.

iii. FCyyy: Foundation Compulsory Course

iv. FEyyy: Foundation Elective Course

v. EOyyy: Open Elective Course

4. Generic Electives

A student may take a course under the category of generic elective(EG) offered by any other department of the institute under the category of core course and discipline centric elective(ED). However, such options shall be offered to a student as per prescribed guidelines of the institute.

V. EVALUATION SCHEME

The courses are evaluated on the basis of continuous assessment, mid-semester examinations and end-semester examinations. The weightage of each of these modes of evaluation for the different types of courses are as follows:

Type of Course	Continuous Assessment (CA), Theory	Mid-Semester Exam (MS), Theory	End-Semester Exam (ES), Theory	Continuous Assessment (CA), Lab	End-Semester Exam (ES), Lab
FE courses	As specified in Table 3 of Foundation Electives				
CC/FC/ED/EG/EO Theory with Tutorial	25	25	50	Nil	Nil
CC/FC/ED/EG/EO Theory with Practical	15	15	40	15	15

Project I and Project II	Nil	Nil	Nil	40	60
Training	Nil	Nil	Nil	40	60
Audit Courses 1*	-	-	-	-	-
1*: The distribution of marks and the minimum marks required for getting "Satisfactory" for Audit courses will be determined by the Department.					

VI. EVALUATION AND REVIEW COMMITTEE

The Committee of Courses and Studies in each department shall appoint one or more Evaluation-cum-Review Committees (ERC), each committee dealing with one course or a group of courses. This ERC consists of all faculty members who are likely to teach such course(s) in the group.

The ERC has the following functions-

(i) To recommend appointment of paper setters/examiners of various examinations at the start of each semester.

(ii) To prepare quizzes, assignments, test papers etc. for Continuous Assessment (CA), Mid-Semester examination (MS) and End Semester (ES) examination and to evaluate them. Normally, each concerned faculty member, who is also a member of ERC, will do this job for his/her class. However, in exceptional circumstances any part of the work may be entrusted to some other member of the ERC.

(iii) To consider the individual representation of students about evaluation and take remedial action if needed. After scrutinizing, ERC may alter the grades awarded upward/downward. The decision of the ERC shall be final.

(iv) To moderate assignments, quizzes etc. for courses given by each of the concerned faculty members for his/her class with a view to maintain uniformity of standards.

(v) To review and moderate the MS and ES results of each course with a view to maintain uniformity of standards.

(vi) To lay guidelines for teaching a course.

(vii)

VII. ATTENDANCE, PROMOTION AND DETENTION RULES

1. A student should normally attend all the classes. However, a student will be allowed to appear in the examination if he/ she has put in a minimum of 75% attendance separately in each course for which he / she has registered. A relaxation up to a maximum of 25% may be

given on the production of satisfactory evidence that (a) the student was busy in authorized activities, (b) the student was ill.

2. A student should submit the evidence to the fact 1(a) and / or 1(b) above within seven working days of resuming the studies. Certificates submitted later will not be considered.
3. No relaxation in attendance beyond 25% is permitted in any case.
4. A student with satisfactory attendance will be promoted to the even semester irrespective of his/ her results in the odd semester examinations.
5. If a student fails to secure a minimum of 22 credits after the completion of second semester, he/ she will not be allowed to register in the third semester till he / she secures a minimum of 22 credits.
6. If a student fails to secure a minimum of 44 credits after the completion of fourth semester, he / she will not be allowed to register in the fifth semester till he / she secures a minimum of 44 credits.
7. There shall be no supplementary examinations. A student who has failed in a course will have to re-register for the course in a subsequent year.
8. If a student fails in any core course during the first four semesters (without repeating a year), he/she will have to re-register for such courses after the fourth semester.
9. If the student does not want to reappear in an **elective course** (that is, EG, ED, EO, FE *but not* CC or FC courses) then he/she can re-register afresh for a new elective course.
10. After second year a student may register for courses leading to a minimum number of credits as prescribed in the scheme and a maximum of 28 credits. Normally a student registers for courses leading to 22 credits.

VIII. DECLARATION OF RESULTS

1. The B.E. Information Technology programme consists of 176 credits. A student will be awarded the degree if he/she has earned 168 or more credits.
2. CGPA will be calculated on the basis of the best 168 credits earned by the student.
3. The candidate seeking re-evaluation of a course shall apply for the same on a prescribed pro-forma along with the evaluation fee prescribed by the University from time to time only for the End Semester Examination within seven days from the date of declaration of result.
4. The Institution/University may cancel the registration of all the courses in a given semester if
   i. The student has not cleared the dues to the institution/hostel.
   ii. A punishment is awarded leading to cancellation of the student's registration.

IX. CURRICULUM MODIFICATION

The curriculum will be updated regularly within a period of 5 to 10 years since last revision, to keep pace with the advancements in the field of Information Technology.

X. CENTRAL ADVISORY COMMITTEE

There shall be a Central Advisory Committee consisting of the following—

a) Dean, Faculty of Technology, Chairman
b) Head of Institution
c) Dean Undergraduate Studies
d) Dean Post Graduate Studies
e) Heads of Departments

This Committee shall have the following functions-

1. Lay guidelines for executing all the provisions and stipulations of the programme.
2. Give an interpretation of the rules in case of differences of opinion, which shall be binding on all.

PROGRAMME OUTCOMES

At the completion of the program the student will achieve the following:

PO1: Ability to understand the fundamental concepts of mathematics for IT

PO2: Ability to design and implement programming language concepts

PO3: Ability to design efficient data structure pertaining to optimal solutions

PO4: Ability to design and analyze various algorithm design techniques

PO5: Ability to understand computer architecture and working of operating system

PO6: Ability to deal with security issues in databases and networks

PO7: Ability to provide innovative solutions to real time problems

PO8: Ability to design and develop software solutions

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

SCHEME SEMESTER-WISE COURSE ALLOCATION

B.E. INFORMATION TECHNOLOGY -SEMESTER I												
Course Code	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
FC001	FC	Mathematics-I	3	1	0	4	25	25	50	-	-	None
FC002	FC	Computer Programming	3	0	2	4	15	15	40	15	15	None
FC003	FC	Electrical & Electronics Engineering	3	0	2	4	15	15	40	15	15	None

FC004	FC	Physics	3	0	2	4	15	15	40	15	15	None
FC005	FC	English-I	2	0	0	2	25	25	50	-	-	None
FExxx **1***	FE	Foundation Elective	-	-	-	2	-	-	-	-	-	-
			23/25 2*			**20**						

1*: The course codes, LTP distribution and Evaluation Scheme for Foundation Electives are given in Table 2.

2*: The actual weekly load depends upon the elective chosen by the student under FE (Refer Table 2)

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY -SEMESTER II												
Course Code	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
FC006	FC	Mathematics-II	3	1	0	4	25	25	50	-	-	None
FC007	FC	English-II	2	0	0	2	25	25	50	-	-	None
ITC01	CC	Chemistry	3	0	2	4	15	15	40	15	15	None
ITC02	CC	Object Oriented Techniques	3	0	2	4	15	15	40	15	15	None
ITC03	CC	Analog and Digital Communication	3	1	0	4	25	25	50	-	-	None
ITC04	CC	Discrete Structure	3	1	0	4	25	25	50	-	-	None
FExxx **1***	FE	Elective Foundation	-	-	-	2	-	-	-	-	-	-
			26/28 2*			**24**						

1*: The course codes, LTP distribution and Evaluation Scheme for Foundation Electives are given in Table 2.

2*: The actual weekly load depends upon the elective chosen by the student under FE (Refer Table 2)

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY - AUDIT COURSES AFTER II SEMESTER					Evaluation Scheme	
Course Code	**Type**	**Course**	**LTP**	**Credits**	**Theory CA**	**Practical CA-ES**
AC001	**Audit**	Audit Courses can be floated during summer break after 2nd semester on: (I) Courses for improvement: These will not be shown on the degree. (II) Courses on new themes: These will be shown on the degree.	-	NIL	The evaluation scheme and minimum grades for getting "Satisfactory" level will be decided by the Department. Student has to achieve the minimum grades prescribed for getting "Satisfactory" level.	

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY -SEMESTER III												
Course No.	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
ITC05	CC	Mathematics-III	3	1	0	4	25	25	50			None
ITC06	CC	Data Structure and Algorithm	3	0	2	4	15	15	40	15	15	None
ITC07	CC	Digital Circuits and Systems	3	0	2	4	15	15	40	15	15	None
ITC08	CC	Database Management System	3	0	2	4	15	15	40	15	15	None
ITC09	CC	Computer Graphics	3	0	2	4	15	15	40	15	15	None
FExxx **1***	FE	Elective Foundation	-	-	-	2	-	-	-	-	-	-
			26/28 2*			**22**						

1*: The course codes, LTP distribution and Evaluation Scheme for Foundation Electives are given in Table 2.

2*: The actual weekly load depends upon the elective chosen by the student under FE (Refer Table 2).

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY -SEMESTER IV												
Course No.	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
ITC10	CC	Probability and Stochastic Processes	3	1	0	4	15	15	40	15	15	None
ITC11	CC	Operating Systems	3	0	2	4	15	15	40	15	15	None
ITC12	CC	Computer System Architecture	3	1	0	4	25	25	50			None
ITC13	CC	Computer Networks	3	0	2	4	15	15	40	15	15	None
ITC14	CC	Software Engineering	3	0	2	4	15	15	40	15	15	None
FExxx **1***	FE	Elective Foundation	-	-	-	2	-	-	-	-	-	-
			25/27 2*			**22**						

1*: The course codes, LTP distribution and Evaluation Scheme for Foundation Electives are given in Table 2.

2*: The actual weekly load depends upon the elective chosen by the student under FE (Refer Table 2).

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY - AUDIT COURSES AFTER IV SEMESTER					Evaluation Scheme	
Course Code	**Type**	**Course**	**LTP**	**Credits**	**Theory CA**	**Practical CA-ES**
AC002	**Audit**	Audit Courses can be floated during summer break after 4th semester on: (III) Courses for improvement: These will not be shown on the degree. (IV) Courses on new themes: These will be shown on the degree.	-	NIL	The evaluation scheme and minimum grades for getting "Satisfactory" level will be decided by the Department. Student has to achieve the minimum grades prescribed for getting "Satisfactory" level.	

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY -SEMESTER V												
Course No.	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
ITC15	CC	Multimedia & Applications	3	0	2	4	15	15	40	15	15	None
ITC16	CC	Theory of Computation	3	1	0	4	25	25	50	-	-	None
ITC17	CC	Design and Analysis of Algorithm	3	0	2	4	15	15	40	15	15	None
ITC18	CC	Linux/Unix Lab	0	0	4	2	-	-	-	50	50	None
1*	EO/EG/ED	Elective(s)	-	-	-	4	-	-	-	-	-	-
			2*			**16/28 3***						

1*: The LTP allocation, Evaluation Scheme and Pre-requisites for Electives are given in Tables 3-5. The course code will depend upon student's choice of elective(s).

2*: The actual weekly load will depend upon the elective chosen by the student.

3*: A student may register for elective(s) courses leading to a minimum of 16 credits and a maximum of 28 credits. Normally a student registers for courses leading to 22 credits.

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY -SEMESTER VI												
Course No.	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
ITC19	CC	Internet and Web Engineering	3	1	0	4	25	25	50	-	-	None
ITC20	CC	Compiler and Translator Design	3	1	0	4	25	25	50	-	-	None
ITC21	CC	Modeling and Simulation	3	0	2	4	15	15	40	15	15	None
1*	EO/EG/ ED	Elective(s)	-	-	-	4	-	-	-	-	-	-
			2*			**16/28 3***						

1*: The LTP allocation, Evaluation Scheme and Pre-requisites for Electives are given in Tables 3-5. The course code will depend upon student's choice of elective(s).

2*: The actual weekly load will depend upon the elective chosen by the student.

3*: A student may register for elective(s) courses leading to a minimum of 16 credits and a maximum of 28 credits. Normally a student registers for courses leading to 22 credits.

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY - TRAINING AFTER VI SEMESTER												
Course No.	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
ITC22 **1***	**CC**	Training	- -	-	-	2	-	-	-	40	60	None

1*: Students will undergo Training in the industry, research organization and reputed institutions after VI semester. This will be evaluated as a VII Semester subject during end-semester examination.

Training gives exposure to students on the working of the industry, on research direction and practical applications of Information Technology and on work ethics.

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY -SEMESTER VII												
Course No.	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
ITC22 **1***	CC	Training(6 -8 weeks)	-	-	-	2	-	-	-	40	60	None
ITC23 **2***	CC	Project-I	-	-	-	4	0	0	0	40	60	None
-	EO/EG/ ED	Elective(s)	-	-	-	4	-	-	-	-	-	-
			3*			**6/28 4***						

1*: The Training undertaken by students during the Summer vacation after VI Semester will be evaluated as a VII Semester subject during end-semester examination.

2*: Project work is based on the student`s ability to understand, design and implement the fundamental concepts of the basic sciences, mathematics, engineering subjects and human values.

3*: The LTP allocation, Evaluation Scheme and Pre-requisites for Electives are given in Tables 3-5.

4*: The actual weekly load will depend upon the elective chosen by the student.

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

B.E. INFORMATION TECHNOLOGY -SEMESTER VIII												
Course No.	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
ITC24 **1***	CC	Project-II	-	-	-	4	0	0	0	40	60	None
-	EO/EG/ ED	Elective(s)	-	-	-	4	-	-	-	-	-	-
			2*			**4/28 3***						

1*: Project work is based on the students' ability to understand, design and implement the fundamental concepts of various basic sciences, mathematics, human values and engineering subjects.

2*: The LTP allocation, Evaluation Scheme and Pre-requisites for Electives are given in Tables 3-5.

3*: The actual weekly load will depend upon the elective chosen by the student.

TABLE-2 LIST OF FOUNDATION ELECTIVES										
Code	**Name of Foundation Elective**	**LTP Alloc.**			**Evaluation Scheme**					**Pre-Requisites**
		L	**T**	**P**	**CA**	**MS**	**ES**	**CA**	**ES**	
FE001	Sports-I	0	0	4	-	-	-	60	40	None
FE002	Sports-II	0	0	4	-	-	-	60	40	FE001
FE003	NSS	0	0	4	-	-	-	60	40	None
FE004	NCC	0	0	4	-	-	-	60	40	None
FE005	Corporate Social Responsibility	2	0	0	25	25	50	-	-	None
FE006	Environmental Sciences	2	0	0	25	25	50	-	-	None
FE007	Environment development and Society	2	0	0	25	25	50	-	-	None
FE008	Spoken Skills in English	2	0	0	25	25	50	-	-	None
FE009	Financial Literacy	2	0	0	25	25	50	-	-	None
FE010	Introduction to Indian society	2	0	0	25	25	50	-	-	None
FE011	Soft Skills and Personality Development	1	0	2	-	-	-	60	40	None
FE012	Business Communication and Presentation Skills	1	0	2	-	-	-	60	40	None
FE013	Theatre	0	0	4	-	-	-	60	40	None
FE014	Dance	0	0	4	-	-	-	60	40	None

FE015	Yoga	0	0	4	-	-	-	60	40	None
FE016	Digital Electronics	3	0	2	25	25	50	60	40	None
FE017	Workshop (Electrical and Mechanical)	0	0	4	-	-	-	60	40	None
FE018	Music	0	0	4	-	-	-	60	40	None
FE019	Sociology of development	2	0	0	-	-	-	60	40	None
FE020	Universal Human Values 1: Self and Family	2	0	0	25	25	50	-	-	None
FE021	Universal Human Values 2: Self, Society and Nature	2	0	0	25	25	50	-	-	FE020

TABLE 3A: LIST OF DISCIPLINE CENTRIC ELECTIVES WITH PRACTICAL

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

LTP Allocation			Evaluation Scheme				
L	**T**	**P**	**CA**	**MS**	**ES**	**CA**	**ES**
3	**0**	**2**	**15**	**15**	**40**	**15**	**15**
Code	**Name of Elective**		**Pre-Requisites**				
ITD01	Distributed System and Computing		ITC11				
ITD02	Microprocessors and Applications		ITC12				
ITD03	Information Security		ITC13				
ITD04	Mobile Communication		ITC13				
ITD05	Artificial Intelligence		ITC04, ITC17				
ITD06	Software Testing		ITC14				
ITD07	Pattern Recognition		ITC04, ITC17				
ITD08	Data ware house and data mining		ITC08				
ITD09	Advanced Database Management		ITC08				
ITD10	Advanced Computer Networks		ITC13				
ITD11	Recent Trends in Information Technology		None				
ITD12	Image Processing		ITC09, ITC15				
ITD13	Adhoc Network		ITC13				
ITD14	Software Quality and Assurance		ITC014				
ITD15	Software Project Management		ITC014				

TABLE 3B: LIST OF DISCIPLINE CENTRIC ELECTIVES WITH TUTORIAL

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

LTP Allocation			Evaluation Scheme				
L	**T**	**P**	**CA**	**MS**	**ES**	**CA**	**ES**
3	**1**	**0**	**25**	**25**	**50**	**-**	**-**
Code	**Name of Elective**		**Pre-Requisites**				
ITD16	Computer Vision		ITC09, ITC15				
ITD17	Information Theory and coding		ITC04, ITC05				
ITD18	Soft Computing		ITC17				
ITD19	Wireless Communication		ITC13				
ITD20	Game Theory		ITC05				
ITD21	Operational Research		FC006,ITC05				
ITD22	E-commerce and E-governance		NONE				
ITD23	Neural Networks		ITC04, ITC17				
ITD24	Genetic Algorithms		ITC17				

TABLE 4: LIST OF GENERIC ELECTIVES (EG)
A student may take any course offered by any department of the institute under the categories of core course (CC) and discipline centric elective(ED).

However, such options shall be offered to a student as per prescribed guidelines of the institute.

TABLE-5 LIST OF OPEN ELECTIVES

Code	Name of Open Elective	LTP Allocation	Evaluation Scheme		Pre-Requisites
			Theory	Practical	

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

		L	T	P	CA	MS	ES	CA	MS	
EO001	Technical Communication	3	1	0	25	25	50	-	-	None
EO002	Disaster Management	3	1	0	25	25	50	-	-	None
EO003	Basics of Financial Management	3	1	0	25	25	50	-	-	None
EO004	Basics of Human Resource Management	3	1	0	25	25	50	-	-	None
EO005	Project Management	3	1	0	25	25	50	-	-	None
EO006	Basics of Corporate Law	3	1	0	25	25	50	-	-	None
EO007	Biological computing	3	1	0	25	25	50	-	-	None
EO008	Basics of social sciences	3	1	0	25	25	50	-	-	None
EO009	Entrepreneurship	3	1	0	25	25	50	-	-	None
EO010	Social work	3	1	0	25	25	50	-	-	None
EO011	Intellectual Property and Patenting	3	1	0	25	25	50	-	-	None
EO012	Supply Chain Management-Planning and logistics	3	1	0	25	25	50	-	-	None
EO013	Organization Development	3	1	0	25	25	50	-	-	None
EO014	Industrial Organisation and Managerial Economics	3	1	0	25	25	50	-	-	None
EO015	Global Strategies and Technology	3	1	0	25	25	50	-	-	None
EO016	Engineering System Analysis and Design	3	1	0	25	25	50	-	-	None

EO017	Biology for Engineers	3	1	0	25	25	50	-	-	None
EO018	Energy, Environment and Society	3	1	0	25	25	50	-	-	None
EO019	Public Policy and Governance	3	1	0	25	25	50	-	-	None
EO020	Numerical Methods	3	0	2	15	15	40	15	15	None
EO021	Mathematical Statistics	3	1	0	25	25	50	-	-	None
EO022	Abstract and Linear Algebra	3	1	0	25	25	50	-	-	None
EO023	Optimization Techniques	3	1	0	25	25	50	-	-	None
EO024	Introduction to Mathematical Software and Programming Languages	2	0	4	15	15	40	15	15	None
EO025	Mathematical Finance	3	0	2	15	15	40	15	15	None
EO026	Quantum Electronics	3	0	2	15	15	40	15	15	None
EO027	Laser Systems and Applications	3	0	2	15	15	40	15	15	None
EO028	Optoelectronics and Photonics	3	0	2	15	15	40	15	15	None
EO029	Electromagnetic Theory and Waveguides	3	0	2	15	15	40	15	15	None
EO030	Polymer Science and Technology	3	0	2	15	15	40	15	15	None
EO031	Semiconductor Physics and Devices	3	0	2	15	15	40	15	15	None
EO032	Elements of Fibre Optics	3	0	2	15	15	40	15	15	None
EO033	Material Physics	3	0	2	15	15	40	15	15	None
EO034	Advanced Electromagnetic	3	0	2	15	15	40	15	15	None

	Theory and Relativity									
EO035	Fibre and Integrated Optics	3	0	2	15	15	40	15	15	None
EO036	Condensed Matter Physics	3	0	2	15	15	40	15	15	None
EO037	Microwave	3	0	2	15	15	40	15	15	None
EO038	Fundamentals of Instrumentation and experimental techniques in Physics	3	0	2	15	15	40	15	15	None
EO039	Lasers and Photonics	3	0	2	15	15	40	15	15	None

SCHEME OF COURSES - B.E. INFORMATION TECHNOLOGY

SYLLABUS OF FOUNDATION CORE COURSES

Course No	Title of the Course	Course Structure	Pre-Requisite
FC001	Mathematics-I	3L-1T-0P	None

COURSE OUTCOMES: By the end of this course, the student will be able to

1. Analyze and test infinite series for its convergence.
2. Find Taylor's series expansion, maxima & minima of functions of one and more variables.
3. Calculate length, area, radius of curvature, surface of revolution and volume of revolution.
4. Calculate area of a given region and volume enclosed by a surface.

COURSE CONTENT:

Infinite Series: Tests for convergence of series (Comparison, Integral, Ratio's, Raabe's, Logarithmic and nth root,), Alternating series, Absolute convergence, Conditional convergence.

Function of Single Variable: Hyperbolic functions, Taylor's and Maclaurin's theorems with remainder terms, Polar Curves, Angle between tangent and radius vector, Curvature and Radius of Curvature, Asymptotes, Curve tracing, Applications of definite integral to area, arc length, surface area and volume of revolution (in Cartesian, parametric and polar co-ordinates).

Function of Several Variables: Partial Derivatives, Differentiability, Total differential, Euler's theorem, Jacobian, Taylor's theorem, Maxima and Minima for functions of two or more variables, Extreme values, Lagrange's method of undetermined multipliers, Differentiation under the integral sign.

Multiple Integrals: Evaluation of double integral (in Cartesian and polar co-ordinates) change of order of integration, integration by change of variables and its applications in area, mass, and volume. Triple integral (in Cartesian, cylindrical and spherical co-ordinates) and its application in volume.

Suggested Readings:

1. G. B. Thomas and R. L. Finney "Calculus and Analytic Geometry" , Pearson Education.
2 R. K. Jain and S. R. K. Iyenger "Advanced engineering mathematics" Narosa.
3 Erwin Kreyszig "Advanced engineering mathematics" Wiley.
4 Michael Greenberg "Advanced engineering mathematics" Pearson Education.

Course No	Title of the Course	Course Structure	Pre-Requisite

FC002	Computer Programming	3L-0T-2P	None

Course Outcomes:

1. To understand the basic terminology program structures used in computer programming to solve real world problems.
2. To learn the process of representing problems and writing, compiling and debugging programs.
3. To develop programming skills in using different types of data, decision structures, loops functions, pointers, data files and dynamic memory allocation/de-allocation.
4. To understand the need for continuing to learn new languages to solve complex problems in different domains.

COURSE CONTENT:

C Programming Language

Thinking like a programmer: problem solving. Components of a problem, algorithm, checking for errors and inconsistencies, writing a pseudocode.

Boolean Logic: Binary Number systems and codes and operations.

Introduction to programming& Basics of C: Concepts of Algorithm and Flowcharts, Process of compilation, Basic features of C Language like Identifier, Keywords, Variable, data types, Operators and Expression, basic screen and keyboard I/O, Control Statements, iteration, nested loops, Enumerated data types, bitwise operators, C Preprocessor statements.

Arrays and Pointers: One and multidimensional dimensional arrays, strings arrays, operations on strings, Array and Pointers, Pointers and strings, Pointer to Pointer, other aspect of pointers,User Defined Data Types: Structures, Unions, bit fields.

Functions: Concept of modular programming, Using functions, Scope of data, Recursive functions, Pointers and functions, Command line arguments.

Linked List: Dynamic memory allocation, singly link list, traversing, searching, insertion, deletion.

Files: Types of files, working with files, usage of file management functions.

C++ Programming Language

Moving from C to C++: Concepts of Object Orientation, Objects, classes, encapsulation, data abstraction, inheritance, delegation, software reuse. Inheritance visibility rules using public, private, protected, member functions: Constructors / destructors, operator (::),accessing member functions within a class, new, delete.

Friend functions and classes, static data and functions, function templates, pointers within a class, passing / returning objects as arguments.

Functions Polymorphism – virtual functions, function overloading, variable definition at the point of use, reference variables, strict type checking, default arguments, type conversion.

Exception handling, streams based I/O.

Trends: Kinds of programming languages.

Guidelines for practical work based on programming concepts:

Programs for temperature conversion, area of triangle, counting frequencies of letters, words to

understand the basic data types, input-output, control flags.
Programs for decision making using selection, looping, processing of arrays for sorting, searching , string manipulations, matrix operations.
Programs for parameter passing to functions, returning values, interactions among functions, pointer with arrays, strings, call by reference.
Programs using structure , pointers and files for linked lists , inventory management etc.
Program using bit wise operators to simulate the combinational circuits.
Program showing the concept of objects, access specifiers and inheritance.

Suggested Readings:

1. B. W. Kernighan and D.M. Ritchie," The C programming language", Prentice Hall.
2. C: The Complete Reference, by Herbert Schildt, Publisher – Tata McGraw Hill.
3. Yashwant Kanitkar, "Let us C", BPB Publication
4. Byron Gottfried," Schaum's Outline of Programming with C", Schaum Series, Tata McGraw Hill
5. Budd, "Object Oriented Programming ", Addison Wesley.
6. D Samantha, "Object oriented Programming in C++ and Java ", PHI
7. Stroustrup," Programming in C++", Special Edition, Addison Wesley

Course No	Title of the Course	Course Structure	Pre-Requisite
FC003	Electrical & Electronics Engineering	3L-0T-2P	None

Course Outcomes:

CO1: To understand the basic concepts of magnetic, AC & DC circuits

CO2: To learn the basics of semiconductor diodes, BJTs

CO3: Will be able to analyze basic electrical and electronic circuits

COURSE CONTENT:

D.C. Circuits and Theorems: Ohm's Law, KCL, KVL Mesh and Nodal Analysis, Circuit parameters, energy storage aspects, Superposition, Thevenin's, Norton's, Reciprocity, Maximum Power Transfer Theorem, Millman's Theorem, Star-Delta Transformation. Application of theorem to the Analysis of dc circuits.

A.C.Circuits: R-L, R-C, R-L-C circuits (series and parallel), Time Constant, Phasor representation, Response of R-L, R-C and R-L-C circuit to sinusoidal input Resonance-series and parallel R-L-C Circuits, Q-factor, Bandwidth.
Magnetic Circuits: Magnetomotive Force, Magnetic Field Strength; Permeability, Reluctance, Permeance, Analogy between Electric and Magnetic Circuits.
Semiconductor Diodes and Rectifiers: Introduction, general characteristics, energy levels, extrinsic materials n & p type, ideal diode, basic construction and characteristics, DC & AC resistance, equivalent circuits, drift &

diffusion currents, transition & diffusion capacitance reverse recovery times, temperature effects, diode specifications, different types of diodes (Zener, Varactor, Schouky, Power, Tunnel, Photodiode & LED), Half wave & full wave rectifiers. Switched Mode Power Supply.

Bipolar junction transistor: Introduction, Transistor, construction, transistor operations, BIP characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations, Eber-Moll's model.

Bias Stabilization: Need for stabilization, fixed bias, emitter bias, self bias, bias stability with respect to variation in I_{co} V_{BE} & β, Stabilization factors, thermal stability.

Suggested Readings:

1. Vincent Del Toro, "Electrical Engineering Fundamentals"
2. Mittle and Mittal, "Basic Electrical Engineering" TMH
3. Boylestad and Nashelsky, "Electronic Devices and Circuit Theory", Pearson
4. Millman & Grabel, "Microelectronics" TMH

Course No	Title of the Course	Course Structure	Pre-Requisite
FC004	Physics	3L-0T-2P	None

Course Outcomes:

1. Knowing important concepts and phenomena linked to relativity, waves and oscillations and be able to do analytical and numerical calculations for faithful measurements, observations and gravitational wave communications.
2. The course is helpful to the students in understanding various optical wave phenomena which are required for optical & electromagnetic wave communications and in optical devices.

Concepts of Laser and Optical Fiber for modern developments in physics which are helpful in designing and developing new devices used in optical communications, medicine, environment, industries and related physics.

COURSE CONTENT:

Relativity: Special Relativity**,** Lorentz Transformations, Velocity addition, Time dilation, Length Contraction, Variation of mass with velocity, Mass and energy, Relativistic momentum and relativistic energy, General theory of relativity, Einstein's theory of Gravitation, Gravitational waves, Gravity and Light.

Oscillations and Waves: Damped and forced oscillations, Sharpness of resonance, Q-factor, Application in resonance, Acoustic waves, Pressure wave equations, Intensity pressure relation, Acoustic impedance, Reflection and transmission of acoustic waves, Impedance matching; Ultrasonics and its applications.

Optics: Interference: Interference due to thin films, Newton's rings, and determination of the wavelength of sodium light, Interference due to wedge shaped film. Diffraction: Fraunhofer diffraction due to single slit and N Slits, Plane transmission grating, Rayleigh criterion of resolution, Resolving power of a grating, Polarization: Polarization in light, Birefringence, Nicol prism, Quarter and half wave plates, Production and analysis of

plane, Circularly and elliptically polarized light, Optical rotation, specific rotation, Polarimeter.

Quantum Theory of Light : Hertz's Experiments- Light as an Electromagnetic Wave, Blackbody radiation, Light Quantization, Compton Effect , X-rays.

LASERS : Absorption and emission of radiation, Main features of a laser, Spatial and temporal coherence, Einstein Coefficients, condition for light amplification, Basic requirement for Laser, Population Inversion - Threshold Condition, Line shape function , Optical Resonators , Three level and four level systems. Classification of Lasers: Solid State Laser-Ruby laser and Gas Laser- He-Ne laser (Principle, Construction and working), Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working), Applications of lasers in the field of medicine, Industry, Environment and Communication.

Fibre Optics : Need for fiber Optic Communication, Physical nature of Optical fiber, Theory of Light propagation in optical fiber, Acceptance angle and numerical aperture, Step index and graded index fibers, Single mode and multimode fibers, Losses in optical fiber, Optical Fiber cables and bundles, Dispersion in optical fibers: Intermodal and Intramodal dispersion.

TERM WORK Experiments: Any ten experiments based on the theory course or related subject as above. For examples : Wavelength by diffraction grating, Newton's rings experiments and bi-prism assembly, resolving power of a Telescope, Nodal-Slide assembly , specific rotation of cane sugar by Polarimeter, dispersive power of Prism, Wavelength of He-Ne laser by diffraction, refractive index for O-ray and E-ray, Brewester's law, Ultrasonic interferometer, numerial aperture of an optical fibre, other experiments based on LASER and optical fiber.

Suggested Readings:

1. Arthur Beiser, Shobhit Mahajan "Concepts of Modern Physics" (McGraw Hill)
2. Serwey , Moses, Moyer "Modern Physics" (Cengage Learning)
3. D S Mathur, "Mechanics" (S Chand & co.)
4. Jenkins and White, "Fundamentals of Optics" (McGraw Hill)
5. N. Subramaniam and Brij Lal, "A Text Book of Optics" (S Chand)
6. Indu Prakash, " A Text Book of Practical Physics", Volume-1, Kitab Mahal Publication.

Course No	Title of the Course	Course Structure	Pre-Requisite
FC005	English-1	2L-0T-0P	None

Course Outcomes:

1. The course will focus on the four integral skills of language, improving the proficiency levels in all of them and to learn to use language as a tool for effective communication.
2. This course will widen the understanding of the learners in all genres of literature (short stories, poetry, autobiographies..) with the help of expository pieces .

3. The course will strive to equip the learner with the ability to express oneself and be understood by others with clarity and precision, in both written and spoken forms.
4. This course will encourage creative use of language through translation, paraphrasing and paragraph writing.
5. Along with the above, the course will also build confidence and encourage the students to use a standard spoken form of English in order to prepare them to face job interviews, workplace and in higher studies.

Course Objectives:

a) This course will focus on oral skills of the speaker with emphasis on speaking and reading.
b) This course will engage with different theories of personality development, personality traits, emotional quotient.
c) It will discuss and engage with topics like social practices, personal habits, interpersonal skills, leadership qualities and people management.

Course Content:

- Practice in dictation, punctuation and spellings, listening and reading comprehension.
- Practice with well formed sentences with stress on remedial grammar.
- Exercises in unseen comprehension, paraphrasing, paragraph writing & summarizing.
- Reinforcement in letter writing, preparing CVs, writing book reviews.
- Exposure to the nuances and usages of the language through newspapers and magazines as an exercise to be in line with current form of language used.
- Proficiency in spoken English with focus on confidence building and standard pronunciation through language lab sessions.

Literature

1. Sadat Hasan Manto: Toba Tek Singh,
2. Abdul Kalam: Wings of Fire (excerpts)
3. Jhumpa Lahiri: The Namesake (excerpts)
4. Khaled Hosseini: The Kite Runner (excerpts)
5. Mohan Rakesh: Halfway House

Language Skills

1. Dictation, punctuation and spellings, listening and reading comprehension.,
2. Correspondence(formal & informal)
3. Reading editorials, columns, speeches & essays

Suggested Readings:

Margaret M Maison, "*Examine Your English*"

Course No	Title of the Course	Course Structure	Pre-Requisite
FC006	Mathematics-II	3L-1T-0P	None
Course Outcomes:			

By the end of this course, the student will be able to

1. Solve system of equations and know the concepts of eigenvalue and eigenvector.
2. Know the concepts of Ordinary Differential Equations and its applications.
3. Know the concepts of Special Functions.
4. Know the concepts of Laplace Transforms and its application to solve Differential Equations

Course Contents:

Matrices: Rank, inverse and normal form of a matrix using elementary transformations, consistency of linear system of equations; linear dependence/ independence, linear transformations, eigenvalues and eigenvectors of a matrix, Cayley-Hamilton theorem, diagonalization.

Ordinary Differential Equations: Second & higher order linear differential equation with constant coefficients, general solution of homogenous and non- homogenous equations, Euler-Cauchy equation, Application to mass- spring system and electrical circuits. Power series method.

Special Functions: Beta and Gamma functions, Dirichlet's Integral. Legendre equation, Legendre polynomials and its properties, Bessel equation, and Bessel function of first kind and its properties, ber and bei functions.

Laplace Transforms: Basic properties, Laplace transform of derivatives and integrals. Laplace of periodic functions. Laplace transforms solution of IVP and simultaneous linear differential equations, unit step function, Dirac-Delta function. Inverse Laplace transform, Convolution theorem.

Suggested Readings:

1. G. B. Thomas and R. L. Finney "Calculus and Analytic Geometry", Pearson Education.
2 R. K. Jain and S. R. K. Iyenger Narosa "Advanced engineering mathematics"
3 Erwin Kreyszig "Advanced engineering mathematics"; Wiley.
4 Michael Greenberg "Advanced engineering mathematics", Pearson Education.

Course No	Title of the Course	Course Structure	Pre-Requisite
FC007	English-II	2L-0T-0P	None

Course Outcomes

1. The course will focus on the four integral skills of language, improving the proficiency levels in all of them and to learn to use language as a tool for effective communication.
2. This course will widen the understanding of the learners in all genres of literature (short stories, poetry, autobiographies..) with the help of expository pieces .
3. The course will strive to equip the learner with the ability to express oneself and be understood by others with clarity and precision, in both written and spoken forms.

4. This course will encourage creative use of language through translation, paraphrasing and paragraph writing.

Along with the above, the course will also build confidence and encourage the students to use a standard spoken form of English in order to prepare them to face job interviews, workplace and in higher studies.

Course Objectives

a) This course will focus on oral & presentation skills of students with practice sessions in the language lab.
b) This course will develop confidence building in oral skills of learners.
c) It will seek to encourage the day to day conversations/dialogues and communicative needs of learners with ample practice in the lab.
d) The theory class will boost practice in ample language exercises to encourage oral skills.
e) This will also involve practice sessions in interview skills, group discussions & pair work.
f) Basics of communication

Course Contents:

Literature

1. Anton Chekov: The Bet
2. Guy de Maupassant: The Necklace
3. D H Lawrence: Odour of Chrysanthemums
4. R K Narayan: Malgudi Days
5. Sarojini Naidu: Bangle Sellers
6. Rupert Brooke: The Soldier/Siegfried Sassoon: Suicide in the Trenches

Language Skills

1. translation, paragraph writing, paraphrasing, summarizing,
2. comprehension

Presentations/book reviews/reading exercises

Suggested Readings:

1. *Advanced English Grammar*: Martin Hewing
2. *Technical Communication*: Meenakshi Raman & Sangeeta Sharma
3. *A Course in Academic Writing*: Renu Gupta

SYLLABUS OF CORE COURSES

Course No	Title of the Course	Course Structure	Pre-Requisite
ITC01	Chemistry	3L-0T-2P	None

Course Outcomes: After completion of the course the students will be able to

CO 1: understand the basic concept of Physical, Inorganic and Organic Chemistry

CO 2: understand the concepts of Polymers, Metals and Alloys

CO 3: understand the concept of Thermal Methods and their applications and basic the basic principles of Green Technology

CO 4: perform titrimetric analysis

CO 5: learn different titration methods by performing experiments

Course Contents:

THEORY

Electrochemistry & Catalysis : Transport No., Nernst Equation of electrode Potential, Reference electrodes, Subsidiary Electrodes, Concentration Cell, Batteries & Fuel Cells, Kinetics of Catalysis

Phase Rule : Deduction of Phase Rule, Basic Definition and Explanation, Phase Diagram of some simple systems (Water & Sulphur), Phase transportation of Cu-Ni, Ag-Pb and some binary systems

Thermal Method of Analysis : Elementary discussions of TGA, DTA & DSC

Inorganic Chemistry : Transition Metal complexes, Crystal Field Theory, synthesis & property of Metallurgy, Ferrous & Non-Ferrous Alloys

Electronic Effects : Inductive Effect, Hyperconjugation & Resonance and their effect on physical & chemical properties of molecules, Mechanisms of some Reactions

Polymers : Effect of polymer structure on properties and production, Technical Applications and synthesis of some thermoplastic and thermoset resins, Natural Rubber, Elastomers, Inorganic Polymers, Ion-exchange Polymers, Conducting Polymers, Bio-degradable Polymers, Molecular Weight of Polymers

Spectroscopy : Infrared, Ultra-Violet and Visible and NMR Spectroscopy and their applications

Analytical Chemistry: Chromatographic Methods of Separation, Gas Chromatography, HPLC & Potentiometric methods

Green Technology : Introduction, Basic Principles of Green Technology, concept of atom economy, Tools of Green Technology, zero waste Technology

PRACTICALS

1. To find the strength (gm/lit.) of a given copper sulphate solution, iodometrically.
2. To find the strength of given potassium dichromate solution using Mohr's salt solution as an intermediate and potassium ferricyanide as an external indicator.
3. Determination of strength (gm/lit.) of a given solution of potassium dichromate with ferrous ammonium sulphate solution using N-Phenyl anthranilic acid as internal indicator.
4. To determine the strength (gm/lit.) of sulphuric acid and oxalic acid in a given solution using NaOH and $KMnO_4$ solutions.
5. To determine the percentage of sodium carbonate in a given sample of commercial caustic soda solution.
6. Argentometric Titrations (i) Volhardic Method
   (ii) By Mohr's method
7. Estimation of silver nitrate against potassium Thiocyanate using ferric indicator.
8. To estimate the strength of barium chloride in a given solution using sodium carbonate and hydrochloric acid solutions.
9. To determination the percentage of calcium carbonate in precipitated chalk using hydrochloric acid and NaOH solutions.
10. To determine the strength of Calcium by EDTA – Complexometric Titration
11. To determine the strength of Hydrochloric acid, conductometrically by titrating against

standard sodium hydroxide solution.

12. To determine the strength of Mohr's salt against solution of potassium dichromate.

Suggested Readings:

1 K. J. Laidler "Chemical Kinetics"
2. R. T. Morrison & R. N. Boyd "Organic Chemistry"
3. J. D. Lee Concise "Inorganic Chemistry"
4. A. I. Vogel Quantitative "Inorganic Chemistry"
5. Jain and Jain "Engineering Chemistry"
6. Balram Pani "Engineering Chemistry"
7. Shashi Chawla "Engineering Chemistry"

Course No	Title of the Course	Course Structure	Pre-Requisite
ITC02	Object Oriented Techniques	3L-0T-2P	None

Course Outcomes: At the end of the course, the student should have

CO1: An understating of the difference between OOAD and Structured Analysis.
CO2: Develop the skills to determine which processes and OOAD techniques should be applied to a given project
CO3: To prepare object-oriented design for small/medium scale problems
CO4: Understand how to implement OO concepts using C++/Java

Course Content: **No of Hours: 40**

Concepts of Object-orientation: Encapsulation, information hiding, object identity, messages, classes, inheritance, polymorphism etc. Difference between Object oriented Analysis and Structured Analysis.

Object-oriented analysis methods:Object Model –Evolution and Elements of an object model, Classes & Objects – Nature of an object, relationships among Objects, Nature of a class relationship among classes, Classification, Key Abstractions and mechanisms

Object Oriented Design: object modeling technique by Rumbaugh,
Functional Modelling: Introduction to Process, Data flow diagram (DFD),
Unified Modeling Language: Use Case Diagram, Class diagrams, Activity Diagram, State Transition Diagram
Object Oriented Construction: Implementation in Object oriented programming Language like c++/java, basic concepts
Object oriented Testing: Unit, Integration and System testing, the testing process. Components and their management,

Suggested Readings:

1. James R Rumbaugh , "Object Oriented Modeling and Design," Prentice Hall.
2. Grady Booch, James R Rumbaugh , "Unified Modeling Language a User Guide," Prentice Hall.
3. James R Rumbaugh, M R.Blah, "Object-Oriented Modeling and Design with UML," Pearson Education
4. A Silberschatz, Henry F. korth, S. Sudarshan, "Database System Concepts", Mcgraw Hill Education
5. Yogesh Singh, "Software Testing", Cambridge : Cambridge University Press,
6. John D. McGregor, David A. Sykes, "A Practical Guide to Testing Object-Oriented Software," Addison Wesley

Course No	Title of the Course	Course Structure	Pre-Requisite
ITC03	Analog and Digital Communication	3L-1T-0P	None

Course Outcomes:

1. To familiarize students with the fundamentals of analog and digital communication systems, to familiarize students with various techniques for amplitude modulation and demodulation of analog signals,
2. To develop the students' ability to determine the effects of receiver frequency and phase errors in synchronous modulation systems
3. To familiarize students with techniques for generating and demodulating narrow-band and wide-band frequency and phase modulated signals
4. to familiarize students with basic techniques for generating and demodulating pulse code modulated signals

Course Content: **No of Hours: 42**

Analog Modulation:Introduction to AM, FM & PM
Amplitude Modulation Generation & Demodulation of AM waves, DSBSC waves, Coherent Detec
DSBSC Signal, Quadrature-Carrier Multiplexing, Generation of SSB waves, Demodulation of SSB wa

Angle Modulation: Frequency & phase Modulation, narrow & Wide-Band FM, BW of FM waves, Generation & Demodulation of FM waves,, S/N ratio, Comparison of AM, FM & PM.
power spectral density, response of linear systems to random signals, Noise in wave modulation s Noise effects in AM,FM & PM systems.
Pulse analog Modulation: Sampling theorem, Sampling of Low Pass and band pass signals, aliasing, Aperture effect, PAM, PWM and PPM generation and demodulation, TDM, Cross talk, Spectral analysis of PAM, PWM and PPM waves, S/N ration for different pulse modulation.
Pulse Digital Modulation: Pulse code modulation signal to quantization noise ratio, probability of error for PCM in AWGN channel, DPCM, DM and ADM modulators and demodulators, Prediction Filter, line coding, Inter symbol Interference.
Digital Transmission through Carrier Modulation Amplitude, Frequency and phase shift keying, Differential phase shift keying, CPFSK, MSK QPSK and QAM modulation & detection, probability of error calculation, Matched.
Digital Pass band transmission and reception, coherent phase shift keying PSK, frequency – shift keying (FSK) and quadri phase –shift keying (QPSK), non-coherent FSK, quadrature amplitude modulation (QAM), Application to Digital Cellular phones and high-speed modems. Effects of noise on baseband digital comm.. systems. Error probability in digital systems.
Introduction to special spectrum modulations, frequency- hopping and direct sequence, code-division multiplexing (CDM). Application to CDMA wireless comm. systems.

Suggested Readings:

Haykin," **An Introduction To Analog And Digital Communications"**
SINGAL, " **ANALOG AND DIGITAL COMMUNICATION"**
Simon Haykins," Communication systems"
Simon Haykins," Digital Communication"
J. G. Proakis," Digital Communication"
Taub & Schilling," Communication systems"

Course No	Title of the Course	Course Structure	Pre-Requisite
ITC04	Discrete Structure	3L-1T-0P	None

Course Outcomes:

CO1: Understand the notion of mathematical thinking.
CO2: Understand the notion of mathematical proofs.
CO3: Understand the notion of algorithmic thinking**.**
CO4: apply the above in problem solving.

Course Content: **No of Hours: 40**

Set Theory: Introduction, set operations, algebra of sets, duality, Finite sets and multi sets, counting principles, power set, partitions
Mathematical Induction, Principle of inclusion and exclusion
Relations: Introduction, Cartesian product, types of relations, closure, representation and composition of relations, posets
Functions: Introduction, types of functions, recursively defined functions, Pigeonhole principle
Logic and Propositional Calculus: Propositions and compound statements, basic logical operations, truth tables, propositional functions, normal forms, tautology and contradiction, conditional and bi conditional statements, algebra of propositions, logical equivalence, arguments, quantifiers, predicate logic
Boolean Algebra: binary relations and their representations, binary operations, duality, semi groups, monoid, groups, rings, homomorphism and isomorphism, CNF and DNF
Hasse diagrams, Lattices
Combinatorics: Permutation, combinations , recurrence relations
Graph Theory: Elementary graph theory, Euclidean and Hamilton paths and circuits, shortest path algorithm
Tree: Introduction, traversal, infix to post fix conversion, construction of tree from preorder and inorder notation

Suggested Readings:

- C. L. Liu "Elements of Distcrete Mathematics", McGraw Hill
- J.P. Trembley and R. Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
- S. Lipschutz and M. Lipson (Schaum`s Series) "Discrete Mathematics" McGraw-Hill

Course No	Title of the Course	Course Structure	Pre-Requisite
ITC05	Mathematics-III	3L-1T-0P	None

Course Outcomes: By the end of this course, the student will be able to

1. Know the concepts of Fourier series, Fourier transforms and Harmonic analysis and its applications.
2. Know evolution of Partial Differential Equations and its methods of solutions for real life problems.
3. Know the concepts of functions of complex variables and its applications to evaluate real integrals.
4. Know the concepts of vector calculus such as gradient, curl, divergence and integral theorems such as Green's Theorem, Stoke's Theorem and Gauss Divergence Theorem and their applications in various fields.

Course Content: **No of Hours: 40**

Fourier Series & Transforms: Periodic functions, Fourier series, Functions of any period p. Even and odd functions, Half range series, complex form of Fourier series, Harmonic analysis. Fourier transform and its properties, Fourier cosine and sine transforms and their properties, applications to PDE.

Partial Differential Equations: Solution of first order equations- Lagrange, non linear first order, Charpit's method, higher order linear equations with constant coefficients. Separation of variables, Solution of Heat, Wave and Laplace equations.

Complex Variables: Functions of a complex variable, analytic functions, harmonic functions, Cauchy -Riemann equations (Cartesian and polar form). Linear fractional transformation, Conformal mapping, Mapping of elementary functions (exponential, trigonometric, hyperbolic and logarithm functions), Contour integration, Cauchy's integral theorem and formula, Power series and its convergence, Taylor's and Laurent series, zeroes, Singularities, Residue theorem, Evaluation of real integrals(around unit circle, no singularity on real line , and singularity on real line) .

Vector Calculus: Differentiation of a vector function, scalar and vector fields, Gradient, Divergence, Curl, line integral, independence of path, Green's theorem and applications. Surface Integral, Stoke's theorem and applications; Volume Integrals, Gauss Divergence theorem and applications

Suggested Readings:

1. Advanced Engineering Mathematics: Jain/Iyenger; Narosa.
2 Advanced Engineering Mathematics: Kreyszig; Wiley.
3 Advanced Engineering Mathematics: Greenberg; Pearson Education.

Course No	Title of the Course	Course Structure	Pre-Requisite
ITC06	Data Structure and Algorithm	3L-0T-2P	None

Course Outcomes:

CO1: To design elementary data structures such as stacks, queues, linked lists, trees, graphs etc. and have practic knowledge on their applications.
CO2: To design algorithms to solve the problems and analyze the time complexity of the algorithms.
CO3: To understand various searching and sorting techniques.
CO4: To identify the appropriate data structure for given problem and perform various operations such as Insert Deletion, Traversal on these data structures.

Course Content: **No of Hours: 40**

Arrays, Stacks and Queues: Fundamentals and Representations, Applications of Arrays, Stacks and Queues, Sparse Matrices Linked lists: Singly/Linear Linked lists, Linked Stacks and Queues, Doubly and Circular Linked Lists, Applications. Trees: Binary Trees, B-Trees, N-ary Trees, B+-Trees, Tree Traversals and Tries, Storage of Trees, Threaded trees, Trees Applications, Hashing. Heaps Graphs: Types, Terminology and Representations, Graph Traversals, Applications of Graphs. Searching and Sorting: Sequential and Binary Searching, Search trees, Sorting Techniques.

SUGGESTED READINGS:

1. E. Horowitz and S. Sahani, "Fundamentals of Data Structures in C", 2nd Edition, Universities Press,
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Addison- Wesley,
3. Schaum's Outline Series, "Data Structure", TMH, Special Indian Ed., Seventeenth Reprint.
4. Y. Langsam et. al., "Data Structures using C and C++", PHI
5. N. Dale and S.C. Lilly, D.C. Heath and Co., "Data Structures"
6. R. S. Salaria, Khanna, "Data Structure & Algorithms", Book Publishing Co. (P) Ltd..
7. Richard F. Gilberg and Behrouz A. Forouzan, "Data Structure A Pseudocode Approach with C", Cengag Learning, 2nd Ed.,

Course No	Title of the Course	Course Structure	Pre-Requisite
ITC07	Digital Circuits and Systems	3L-0T-2P	None

Course Outcomes:

CO1: To help the student in understanding the digital circuits and the principles and application of the building blocks like diodes, flip flops, registers, ROM etc.

CO2: To make students analyze and design combinational and sequential circuits.

Course Content: **No of Hours: 40**

Boolean Algebra, Venn diagram, switching function and minimization of switching functions with don terms etc. (Karnaugh's Map Method & Tabulation Techniques)

Introduction Logic Gates, Logic Families TTL, Tristate Logic, ECL, CMOS and T^2 L Logic, Logic parameters etc.

Bistable, Monostable, Astable and Schmitt trigger circuit.

Gated memories, M/S flipflops, Shift Registers Serial & Parallel Counters, Ring counters, Up Down counters.

Designing of combinational circuits like code converter, address, comparators, etc.

Introduction to semiconductor memories: ROM, PROM, EPROM, STATIC & DYNAMIC RAM.

Introduction to Encoders, Decoders, Multiplexer, demultiplexer, Designing combinational circuits with multiplexers and other digital logic blocks, PROM.

Concept of Digital to Analog Conversion Ladder Networks, and Concept of Analog to Digital convers Dual slope method, V-F conversion, stair-case Ramp-method/counter method, successive approximatio of A/D converters etc.

Introduction to design of synchronous & asynchronous sequential circuit flow table realization from verbal description, ASM charts, minimization of flow-table and concept of state assignments.

Course No	Title of the Course	Course Structure	Pre-Requisite
ITC08	Database Management System	3L-0T-2P	None

Course Outcomes:

CO1: Create database with different types of integrity constraints and use the SQL commands such as DDL, DML to access data from database objects.

CO2: Write subqueries, Learn to implement SQL Join operations, create indexes and report aggregated data using group functions.

CO3: Write SQL Query using DCL Statements to GRANT, REVOKE, and TCL statements to COMMIT and ROLLBACK a database structure.

CO4: Create and drop views and Simple Triggers using SQL.

Course Content: **No of Hours: 40**

Introduction to database systems: Overview, File Systems Vs. a DBMS, Advantages of DBMS, Levels of Abstraction, Data Independence, Data Models and their comparison (Hierarchical, Network, Relational Model).

Relational Data models: Structure of Relational Database, Integrity Constraints over relations, Enforcing Integrity Constraints, Relational Algebra and Calculus, Introduction to SQL.

Database Design: Top down approach (ER Model), Participation Constraints, Specialization, Generalization and Aggregation, Bottom up approach (Normalization), Normal Forms Based on Primary Keys, (1NF, 2NF, 3NF & BCNF), Transformation of ER Schema to relational tables.

Transactions and File system: Transactions, Concurrency Control and Database Recovery, Database Security Introduction to File System, File Organization, File Access Methods, File Storage Devices.

Management Information system: Basic Architecture of MIS, Components of MIS –Reporting styles, frequency, targeted managerial level, software and Hardware. Targeted audience of MIS design and development of MIS for various functional areas: Marketing, finance, purchasing, production, distribution, human resource department, implementation aspects, implementation framework, basics, catalysts & change agents.

Suggested Readings:

- Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Tata McGraw Hill.
- Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson / Addision wesley.
- C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Pearson Education.
- Raghu Ramakrishnan, "Database Management Systems", McGraw Hill.
- S.K.Singh, "Database Systems Concepts, Design and Applications", Pearson Education.
- James A O'Brien, George M Marakas and Ramesh Behl, Management Information Systems, Tata