

PONDICHERRY UNIVERSITY
(A CENTRAL UNIVERSITY)
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE

REGULATIONS, CURRICULUM & SYLLABUS
(For Affiliated Colleges)

B.Sc. (Honors) DEGREE PROGRAMME

B.Sc. Information Technology
(Honors with Research)

B.Sc. Information Technology
(Honors)

(Under the National Education Policy 2020)

Effective from the Academic Year (2023 - 2024)



November 2023

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1. PREAMBLE

In the ever-evolving landscape of the digital age, Information Technology (IT) stands as a cornerstone of innovation, efficiency, and transformation. The B.Sc Information Technology program is designed to prepare students for the challenges and opportunities of this dynamic field. This program provides a commitment to nurture the next generation of IT professionals capable of addressing the complex technological needs of today's world. The main objectives of the course are to:

- Develop technical proficiency in Information Technology, covering areas such as IT fundamentals, Enterprise IT infrastructure, cloud computing , IoT, Cybersecurity, Data Center Management, and more.
- Nurture critical thinking, problem-solving, and innovation to empower the graduates to adapt and thrive in the ever-changing IT industry.
- Introduce students to the niche areas of IT and keep them abreast of the developments in the IT industry.
- Prepare students for successful careers in IT by offering practical hands-on experiences and opportunities for professional growth.
- Cultivate an interest for lifelong learning to ensure that our graduates remain at the forefront of technological advancements throughout their careers.
- Enable holistic, multidisciplinary, and skill-oriented knowledge development in the students.

The B.Sc Information Technology programme offers a diverse curriculum that combines theoretical knowledge with hands-on experience. The students will be ready for the jobs available in different fields like:

- IT infrastructure deployment
- PC, Network and Mobile Troubleshooting
- Enterprise IT infrastructure
- Remote Infrastructure Management
- Network Protocols & Administration
- Cloud Computing & IoT
- 5G Communication Technologies
- Data Center Management
- AI & Machine Learning
- High Performance Computing
- Cryptography & Cybersecurity

2. PROGRAMME OUTCOMES

Upon completion of the Bachelor's in Information Technology programme, students will achieve the following outcomes in the field of Information Technology:

1. **Discipline Knowledge:** Attain a comprehensive understanding of Computer Science fundamentals and skills concerning IT and IT infrastructure management.
2. **Problem-Solving Skills:** To work with IT infrastructure and solve the problem relating to IT infrastructure and resources management.
3. **Design and Development of Solutions:** Being able to apply the discipline knowledge and problem-solving skills to design and manage IT infrastructure and their configurations in order to provide the needed solutions for an efficient IT functioning of an organization.
4. **Modern Tool Usage:** Identify, select, and utilize modern scientific programming and IT tools and techniques for modeling, prediction, data analysis, and problem-solving in the field of Information Technology.
5. **Create New Solutions:** Using the discipline knowledge, problem-solving, solution designing, and tools usage skill set to create novel and innovative IT infrastructure and IT infrastructure management strategies.
6. **Communication:** Develop effective communication skills, both in oral and written forms, to facilitate clear and concise interaction.
7. **Holistic, multidisciplinary, and skill-oriented knowledge development:** enable students to obtain knowledge and skills in a multidisciplinary flavor constituting holistic development.
8. **Ethics on Profession, Environment, and Society:** Exhibit professional ethics to maintain integrity in a working environment and demonstrate concern for societal impacts resulting from IT-based solutions for problems.
9. **Commitment to Lifelong Learning:** Cultivate the ability to become an independent learner and nurture a "Learn-Unlearn-Relearn" mindset to adapt with the evolving technologies and methodologies.
10. **Motivation for Higher Studies:** Develop inspiration and motivation to pursue higher education in the field of Information Technology, advancing knowledge and expertise.

These programme outcomes serve as a foundation for shaping the curriculum and assessments within the Bachelor's in Information Technology programme, ensuring that students acquire the necessary skills and knowledge to excel in the field upon graduation.

3. DEFINITIONS

Terms used in the NEP Regulations shall have the meaning assigned to them as given below unless the context otherwise requires:

A. Credit: A credit is the number of hours of instruction required per week for the given subject in a given semester of 16-18 weeks. One credit is equivalent to 15 hours of teaching (lecture or tutorial) or 30 hours of practice or field work or community engagement and service per Semester.

B. Academic Year: Means the year starting on 1st day of July and ends on the 30th day of June succeeding year.

C. Residence time: Means the time a student spends for attending classes in the College/Institution (either Online/Offline) as a full-time student and enrolled in any Academic programme of the Institution.

D. Semester: Means 18 weeks (90 Working days) of teaching-learning session of which two weeks shall be set apart for examinations and evaluation.

E. Grade: Means a letter grade assigned to a student in a course for his/her performance at academic sessions as denoted in symbols of: O(Outstanding), A+(Excellent), A(Very good), B+(Good), B(Above average), C(Average), P(Pass), F(Fail) and Ab(Absent) with a numeric value of O=10, A+=9, A=8, B+=7, B=6, C=5, P=4, and F=0, Ab=0.

F. Grade Point Average (GPA): Means an average of the Grades secured by a student in all courses in a given academic session duly weighted by the number of credits associated to each of the courses.

G. Cumulative GPA (CGPA): Means the weighted average of all courses the student has taken in the entire programme of study.

H. Common courses: Means the set of courses that all students who are admitted are required to study; these courses include, Languages (English- Modern Indian languages), NEP specific courses viz. Understanding India, Environmental sciences/Education, Health and wellbeing/Yoga, and Digital & Technological solutions.

I. Major Discipline Courses: Means the core subjects mandatory for the Computer Science discipline. These courses are common across all specializations of Computer Science.

J. Minor Discipline Courses: Means allied/elective/specialization specific subjects of Computer Science discipline. Based on the set of Minor Discipline Courses the candidate study, specialization in Computer Science will be awarded. Eg: B.Sc. (Computer Science) with minor discipline courses in Artificial Intelligence and Machine Learning will be awarded B.Sc. Computer Science with Specialization in AI&ML.

K. Credit Requirements: For a Degree/Diploma/Certificate Programme means the minimum number of credits that a student shall accumulate to achieve the status of being qualified to receive the said Degree, Diploma/Certificate as the case may be.

L. Exit option: Means the option exercised by the student, to leave the Programme at the end of any given Academic year.

M: Lateral entry: Means a student being admitted into an ongoing Programme of the University otherwise than in the 1st year of the programme.

N: Vocational Studies/Education: Means set of activities for participation in an approved project

or practical or lab, practices of application of scientific theories, studio activities involving students in creative artistic activities, workshop-based activities, field-based shop-floor learning, and Community engagement services, etc. **(These courses are expected to enable students to incorporate the learned skills in daily life and start up entrepreneurship.)**

O: Skill-based learning/project: Means activities designed to understand the different socio-economic contexts, first-hand understanding of the policies, regulations, organizational structures, processes, and programmes that guide the development process.

P: Work-based internship: Means structured internships with Software Companies, Research and Higher Educational Institution Laboratories, Corporate offices, etc. which will further improve employability.

4. AWARD OF UG DEGREE/DIPLOMA/CERTIFICATE

Four years B.Sc.Degree programme shall have options for earning a Certificate/ Diploma/ UG Degree/ UG Degree with Honors based on the exit option exercised by the candidates.

4.1 Degree and Nomenclature

Candidates who complete Eight semesters and earn a minimum of 160 credits will be awarded either of the following degrees after successful completion of the other requirements.

- B.Sc. Information Technology (Honors with Research)*
- B.Sc. Information Technology (Honors) **

* - for candidates who complete a research project work in the Eighth Semester.

** - for candidates who complete 3 theory courses (MJD 21, MJD 22, and MJD 23) instead of the research project work in the Eighth Semester.

4.2 Degree with Specialization

Out of the above said 160 credits, the candidates shall earn 111 credits from the Hardcore courses and the remaining 49 credits shall be earned from the subjects they choose to study from the list of softcore courses. These 49 credits are assigned across 13 courses as listed below:

Courses	Credits per course	Total Credits
MID 1 to MID 8	4	8 x 4 = 32 Credits
MJD 19 & MJD 20	4	2 x 4 = 08 Credits
SEC 1, SEC 2 & SEC 3	3	3 x 3 = 09 Credits
Total Credits		49 Credits

The 13 courses under the above said categories are chosen from the specialization of Information Technology.

4.2.1 Exit Options

Candidates can exercise the following exit options and obtain the said certificate or diploma or degree, if the minimum required credits are earned and other conditions are met.

Exit after 2nd Semester: Certificate in Information Technology will be awarded for candidates who exit the course at the end of 2nd semester and earned a minimum of 40 credits and have completed a Summer Internship of 4 credits for 4-6 weeks duration, during the summer vacation post 2nd semester.

Exit after 4th Semester: Diploma in Information Technology will be awarded for candidates who exit the course at the end of 4th semester and earned a minimum of 80 credits and have completed a Summer Internship of 4 credits for 4-6 weeks duration, during the summer vacation post 4th semester.

Exit after 6th Semester: UG Degree in Information Technology (B.Sc. (IT)) will be awarded for candidates who exit the course at the end of 6th semester and earned a minimum of 120 credits and have completed a Summer Internship of 4-6 weeks duration, during the summer vacation post 4th semester.

Exit after	Credits and other requirements	Awards
2 nd Semester	Min: 40 Credits, Internship: 4-6 Weeks	Certificate in Information Technology
4 th Semester	Min: 80 Credits, Internship: 4-6 Weeks	Diploma in Information Technology
6 th Semester	Min: 120 Credits, Internship 4-6 Weeks	B.Sc. Information Technology

5. PEDAGOGICAL APPROACHES

a) Lecture Courses	Regular classroom lectures by qualified / experienced Expert Teachers <ul style="list-style-type: none"> These Lectures may also include classroom discussion, demonstrations, case analysis Use of Models, Audio-Visual contents, Documentaries, PPTs may supplement.
b) Tutorial Courses	Problem solving Exercise classes guided discussion, supplementary readings vocational training, etc.
c) Practical / Lab work	Practical Lab activity with Theoretical support Mini projects, Activity based engagement, Program executions, Data processing and presentation exercise.
d) Seminar Course	A course requiring student to design and participate in discussions, Group Discussions, Elocution and Debate, Oral Communication Paper presentations, Poster Presentation, Role play participation,

	Quiz competitions, Business plan preparation/presentation, etc.
e) Internship course	Courses requiring students to <i>Learn by Doing</i> in the workplace external to the educational Institutions. Internships involve working in Software Companies, Research and Higher Educational Institution Laboratories, Corporate Offices, etc. All Internships should be properly guided and inducted for focused learning.
f) Research Project	Students need to study and analyze the recent research publications from indexed/peer reviewed journals in their area of specialization. Outcome of the study and analysis need to be presented as a thesis or research report with necessary experimental results.

6. ACADEMIC AUDIT OF COURSES

Internal Quality Assurance Cell (IQAC) at every Institution is expected to supervise the implementation of NEP Regulations in these programmes. Availability of required number of Classrooms, Faculty rooms, Labs, Library facilities, Computer Centre and recruitment of Faculty members, allocation of funds for running the Science Labs/Computer Centre etc., is the responsibility of the College Administration.

7. ADMISSIONS & LATERAL ENTRY

7.1 Admissions Eligibility

For Affiliated Colleges: The candidates for admission to this programme shall be required to have passed 10+2 / 10+3 system of examinations or equivalent with mathematics / business mathematics / equivalent as one of the subjects of study.

Students shall be admitted to this programme based on admissions criteria fixed by the University / Government of Puducherry from time to time.

7.2 Lateral Entry

As per NEP, students have a choice of exit and entry into the programme multiple number of times. UGC specifies that about 10% of seats over and above the sanctioned strength shall be allocated to accommodate the Lateral Entry students.

Candidates seeking entry at the second, third and fourth year, should meet the necessary eligibility criteria with respect to the certificate / diploma / degree they possess, with necessary minimum credits banked in the Academic Bank of Credits (ABC). Such students who get admitted in later years, other than first year will be guided by the following clauses:

- that the University shall notify the admission process and number of vacancies open for lateral entry.
- that the Lateral entrants shall be admitted only after such transparent screening process

and such procedure that the University may prescribe from time to time. University may prescribe different methods of screening for different programmes depending on the circumstances prevailing in each case.

- Lateral entry shall be permissible only in the beginning of years 2, 3, 4 of the Under Graduate / Honors programme; provided that the students seeking lateral entry shall have obtained the minimum pass marks / grades fixed by the University in their previous academic years.

8. EVALUATION (INTERNAL & END SEMESTER ASSESSMENT) AND GRADES

All Credit courses are evaluated for 100 marks. Internal Assessment component is for 25 marks and the End Semester University exam is for 75 marks for theory courses. In case of practical courses, research project work etc., Internal Assessment component is for 50 marks and the End Semester University exam is for 50 marks.

Internal Test Scheme: Principal of the College schedules the Mid-Semester Exam for all courses during 8/9th week of start of classes. Mid-Semester exam for 90 minutes' duration need to be conducted for all these theory courses. The evaluated marks need to be uploaded to Controller of Examinations of University. The answer books of Mid-Semester exams need to be preserved until the declaration of results by the University.

8.1 INTERNAL ASSESSMENTS (For courses upto 6th Semester)

8.1.1 Internal Assessment Marks for Theory subjects

Total Internal Assessment mark for a theory subject is 25 marks. The breakup is as follows:

Evaluation Component	Marks
A. Mid Semester Exam (one)	20
B. Percentage of Attendance	05
Total	25

8.1.2 Internal Assessment marks for Practical / Internships subjects

Faculty member in-charge of Lab practical shall evaluate the practical subjects for 50 marks. The breakup is as follows:

Evaluation Component	Marks
A. Mid-Semester Practical Exam (one) / Viva-voce	20
B. Practical Record / Internship Report	25
C. Percentage of Attendance	05
Total	50

8.1.3 Internal Assessment marks for Research Project Work

There shall be a faculty member assigned as a Project Guide for each candidate doing the Research Project. Progress of the candidate can be assessed once in a month in a project review meeting. Three project review meetings shall be conducted for Internal Assessment.

Project review committee may be constituted and the committee shall organize project review meetings and evaluate the progress and to award the Internal Assessment marks. Internal Assessment component for the Research Project is 50 Marks. The breakup is as follows:

Evaluation Component	Marks
A. Monthly Review (3 Reviews – 10 Marks each)	30
B. Project Report	10
C. Project Presentation and viva-voce	10
Total	50

8.1.4 Internal Assessment marks for Theory Subjects with Practical Components

Faculty member in-charge of Theory Subjects with Practical Component shall evaluate the candidates both for their performance in theory and practical. Internal Assessment marks for Theory Subjects with Practical Components is 25 marks. The breakup is as follows:

Evaluation Component	Marks
A. Mid Semester Exam (one)	15
B. Observation Note / Practical Record	05
C. Percentage of Attendance	05
Total	25

8.1.5 Marks for Attendance is as follows

Attendance %	Marks
Below 75%	0

75% - 80%	1
80% - 85%	2
85% - 90%	3
90% - 95%	4
95% - 100%	5

8.2 END SEMESTER ASSESSMENT [For courses upto 6th Semester]

Controller of Examinations (COE) of Pondicherry University schedules the End-Semester exams for all theory and practical subjects based on university calendar. For Theory courses with Practical components, End semester exams shall be conducted separately for Theory and Practical.

A detailed Exam Time Table shall be circulated at least 15 days before the start of exams, mostly during 15/16th week of the Semester. Question Papers shall be set externally based on BoS approved syllabus. All students who have a minimum of 70% attendance are eligible to attend the end-semester exams. Attendance percentage shall be calculated for each course to decide the eligibility of the candidate for writing the end-semester examination.

8.2.1 Breakup of End Semester Marks

(All End Semester Exams shall be conducted by the Pondicherry University)

The question paper shall be set as per the Bloom's Taxonomy. Various levels along with it's description and sample questions are as follows:

Knowledge: Recall or remember previously learned information.

Example: List the basic data types in Python

Comprehension: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas.

Example: Explain how a stack data structure works.

Application: Apply knowledge and concepts to solve problems in new situations. Use learned information in a different context.

Example: Write a Python program to solve the deadlock problem.

Analysis: Break down information into parts and examine the relationships between the parts. Identify motives or causes.

Example: Analyse the efficiency of two sorting algorithms and compare their advantages and disadvantages.

Synthesis: Create a new whole by combining elements in novel ways. Use creativity to produce something original.

Example: Design a web application that can generate a time table of a school.

Distribution of questions at various levels are as indicated.

Course Components	Max. Marks	End-Sem Exam Duration
A. Theory subjects: Sec A: 10 Questions of 2 Marks each (20 Marks) <i>(Knowledge : 3, Comprehension : 2, Application : 3, Analysis:2)</i> Sec B: 5 out of 7 Questions of 5 Marks each (25 Marks) <i>(Knowledge : 1, Comprehension : 2, Application : 1, Analysis:3)</i> Sec C: 2 Either/OR choice questions of 15 Marks each (30 Marks) <i>(Application : 1, Analysis:1)</i> Questions from all units of Syllabus equally distributed.	75 Marks	3 Hours
B. Skill Enhancement/ Practical/Internship/Project Work subjects: Skill Enhancement / Practical Subjects: Based on Practical Exams conducted by CoE of University Internship / Research Project Work: Presentation of the work / Report / Viva-voce examinations	50 Marks	3 Hours --
C. Theory Subjects with Practical Components: i. Theory Component: Sec A: 5 Questions of 2 Marks each (10 Marks) <i>(Knowledge : 3, Comprehension : 2, Application : 3, Analysis:2)</i>	50 Marks	3 Hours

<p>Sec B: 5 out of 7 Questions of 4 Marks each (20 Marks) (<i>Comprehension : 2, Application : 3, Analysis:2</i>)</p> <p>Sec C: 2 Either or type questions of 10 Marks each (20 Marks) (<i>Analysis / Synthesis</i>)</p> <p>Questions from all units of Syllabus equally distributed.</p> <p>ii. Practical Component:</p> <p>Based on Practical Exams / Presentation / Viva-voce with external examiner appointed by the University Controller of Examinations, and schedules exclusively prepared for such practical examinations by the University Examination Section.</p> <p>The examination shall be conducted for 50 Marks and reduced to 25 Marks.</p> <p>Total Marks: 75 (Theory: 50 Marks + Practical: 25 Marks)</p>	25 Marks	3 Hours
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8.3 CONSOLIDATION OF MARKS AND PASSING MINIMUM

Controller of Examinations of the University consolidates the Internal Assessment marks uploaded by the Colleges and marks secured by students in End-Semester examinations. The total marks will be converted into letter grades. The passing minimum is 40% marks (Internal Assessment + End Semester Assessment put together) and students who secure between 40% and 49% will be awarded 'P' (Pass Grade).

8.3.1 Arrear Exam

A student who secures less than 40% marks in aggregate is declared as **Fail** and that student is eligible to take up supplementary examination by registering to the failed course in the following Semester. All other candidates who failed due to shortage of attendance and those who are seeking to improve the grade shall repeat the course.

8.3.2 Letter Grades and Calculation of CGPA

The total marks secured by a student in each subject shall be converted into a letter grade. UGC Framework has suggested a Country wide uniform letter grades for all UG courses. The following table shows the seven letter grades and corresponding meaning and the grade points for calculation

of CGPA.

Equivalent Letter Grade	Meaning	Grade Points for Calculation of CGPA
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

In order to work out the above letter grades, the marks secured by a student (Total of Internal Assessment and End Semester Assessment) would be categorized for relative grading.

The range of marks for each grade would be worked as follows:

- Highest marks in the given subject: X
- Cut of marks for grading purpose: 50 marks
- Passing minimum: 40
- Number of grades (except P - Pass) (O, A+, A, B+, B, C): G = 6
- Range of marks: $K = (X - 50) / G$

(i) If $K \geq 5$, then the grades shall be awarded as given in the following table.

Range of Marks in %	Letter Grade Points for	Grade Points for
X to (X-K) + 1	O	10
(X-K) to (X-2K) + 1	A+	9
(X-2K) to (X-3K) + 1	A	8
(X-3K) to (X-4K) + 1	B+	7
(X-4K) to (X-5K) + 1	B	6
(X-5K) to 50	C	5
40 – 49	P	4
Below 40	F	0
Absent (Lack of Attendance)	Ab	0

(ii) If $K < 5$, then the grades shall be awarded as given in the following table.

Range of Marks in %	Letter Grade Points for	Grade Points for
80-100	O	10
71-79	A+	9
66-70	A	8
61-65	B+	7
56-60	B	6
50-55	C	5
40-49	P	4
Below 40	F	0
Absent (lack of attendance)	Ab	0

8.3.3 Calculation of Semester Grade Point Average and Cumulative Grade Point Average

Semester Grade Point Average (SGPA) is calculated by taking a weighted average of all grade points secured by a candidate from all subjects registered by him/her in the given Semester. The weights being the number of credits that each subject carries.

Cumulative Grade Point Average (CGPA) shall be calculated as the weighted average of credits that course carries and the value of Grade points averaged for all subjects.

8.3.4 Computation of SGPA and CGPA

The following procedure shall be followed to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student to the sum of the number of credits of all the courses undergone by a student, i.e. $SGPA (S_i) = \Sigma(C_i \times G_i) / \Sigma C_i$

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.

(i) Example for Computation of SGPA where candidate has not failed in any course

Semester	Course	Credit	Letter Grade	Grade point	Credit Point (Credit x Grade)
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	B	6	3 X 6 = 18
I	Course 4	3	O	10	3 X 10 = 30
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	B	6	4 X 6 = 24
		20			139
	SGPA				139/20=6.95

(ii) Example for Computation of SGPA where candidate has failed in one course

Semester	Course	Credit	Letter Grade	Grade point	Credit Point (Credit x Grade)
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	B	6	3 X 6 = 18
I	Course 4	3	O	10	3 X 10 = 30
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	F	0	4 X 0 = 00
		20			115
	SGPA				115/20=5.75

(iii) Example for Computation of SGPA where candidate has failed in two courses

Semester	Course	Credit	Letter Grade	Grade point	Credit Point (Credit x Grade)
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	F	0	3 X 0 = 00
I	Course 4	3	B	6	3 X 6 = 18
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	F	0	4 X 0 = 00
		20			85
	SGPA				85/20=4.25

The CGPA shall also be calculated in similar way as shown in examples (i), (ii) and (iii) of SGPA for all subjects taken by the students in all the semesters. However, if any student fails more than once in the same subject, then while calculating CGPA, the credit and grade point related to the subject in which the student fails in multiple attempts will be restricted to one time only. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

In case of audit courses offered, the students may be given (P) or (F) grade without any credits. This may be indicated in the mark sheet. Audit courses will not be considered towards the calculation of CGPA.

8.3.5 Declaration of Results

Controller of Examinations (COE) of the University shall declare the results of given UG programme following the CGPA secured by students by the end of 6th Semester and 8th Semester.

8.3.6 Classification of Divisions

Range of CGPA	Result
9.0 – 10	First Class with distinction [#]
6.0 - 8.99	First Class
5.0 - 5.99	Second Class
4.0 - 4.99	Pass

[#] Distinction will be awarded **ONLY** to those candidates who have cleared **ALL** subjects in the first attempt.

8.4 INTERNAL ASSESSMENT/ END-SEMESTER ASSESSMENT/ PASSING MINIMUM/GRADES (FOR 7th & 8th SEMESTERS)

Regulations to be notified in the next revision after the confirmation from University NEP committee.

9. MINIMUM CREDIT REQUIREMENTS

S.No	Component	3-year UG			4-year UG (Honors / Honors With research)		
		Credits	Courses	Cr/Course	Credits	Courses	Cr/Course
1	Major Disciplinary/ Interdisciplinary Courses	56	14	4	76	19	4
2	Minor Disciplinary/ Interdisciplinary Courses	24	6	4	32	8	4
3	Multi-Disciplinary Courses	9	3	3	9	3	3
4	Ability Enhancement Courses	8	4	2	8	4	2
5	Skill Enhancement Courses	9	3	3	9	3	3
6	Value-added courses	8	4	2	8	4	2
7	Summer Internship (MJD11)	4	1	4	4	1	4
8	Community Engagement and Service	2	1	2	2	1	2
9	Research Project/Dissertation	--	--	--	12	Project or 3 Courses ^{##}	
Total		120			160		

^{##}Note: Honors students not undertaking research will do 3 courses for 12credits in lieu of a research project/Dissertation.

- MJD: Major Disciplinary (Compulsory – Hardcore Subjects)
- MID: Minor Disciplinary (Specialization Specific – Softcore Subjects)
- MLD: Multi-Disciplinary
- AEC: Ability Enhancement Courses
- SEC: Skill Enhancement Courses
- VAC: Value Added Courses
- SG: Specialization Group
- Course Code: IT1MJ01(E) (IT- B.Sc. Information Technology, 1-Semester, MJ-Component, 01-Course Number in the respective component, E-Elective)

**B.Sc. INFORMATION TECHNOLOGY
CURRICULUM**

FIRST SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 1	IT1MJ01	Digital Logic Fundamentals	H	4	3		2
2	MID 1	IT1MI01	IT Essentials	S	4	3		2
3	MLD 1		One course from the MLD streams 1 to 10 (Table 15)	H	3	4		
4	AEC 1	IT1AE01	English I	H	2	2		2
5	SEC 1		S.No. 1 or 2 from Table 7	S	3	2		2
6	VAC 1	IT1VA01	Understanding India	H	2	4		0
7	VAC 2	IT1VA02	Environmental Sciences/Education/ Higher Order Thinking	H	2	4		0
Total					20	30 Hours		

SECOND SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 2	IT2MJ02	Problem Solving & Programming Fundamentals	H	4	3		2
2	MID 2	IT2MI02	PC, Network and Mobile Troubleshooting	S	4	3		2
3	MLD 2		One course from the MLD streams 1 to 10 except the stream chosen in MLD1 (Table 15)	H	3	4		
4	AEC 2	IT2AE02	Indian Language I	H	2	2		2
5	SEC 2		S.No. 3 or 4 from Table 7	S	3	2		2
6	VAC 3	IT2VA03	Health & Wellness/Yoga Education/ Universal Human Values	H	2			4
7	VAC 4	IT2VA04	Digital Technologies	H	2	3		
Total					20	30 Hours		

THIRD SEMESTER								
S.No	Component	Course Code	Title of the Course	H / S	Credits	Hours/Week		
						L	T	P
1	MJD 3	IT3MJ03	Mathematical Foundations of CS	H	4	4	1	
2	MJD 4	IT3MJ04	Data Structures	H	4	3		2
3	MID 3	IT3MI03	Enterprise IT infrastructure	S	4	3		2
4	MLD 3		One course from the MLD streams 1 to 10 except the streams chosen in MLD1 and MLD2 (Table 15)	H	3	4		
5	AEC 3	IT3AE03	English II	H	2	2		2
6	SEC 3		S.No. 5 or 6 from Table 7	S	3	2		2
Total					20	27 Hours		

FOURTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 5	IT4MJ05	Computer System Architecture	H	4	4	1	
2	MJD 6	IT4MJ06	Design and Analysis of Algorithms	H	4	3		2
3	MJD 7	IT4MJ07	Object Oriented Programming	H	4	3		2
4	MID 4	IT4MI04	Remote Infrastructure Management	S	4	3		2
5	AEC 4	IT4AE04	Indian Language II	H	2	2		2
6	Project	IT4CS01	Community Engagement and Service	H	2			6
Total					20	30 Hours		

FIFTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 8	IT5MJ08	Operating Systems	H	4	3		2
2	MJD 9	IT5MJ09	Database Management Systems	H	4	3		2
3	MJD 10	IT5MJ10	Management Strategies & Concepts	H	4	4		
4	MID 5	IT5MI05	Network Protocols & Administration	S	4	3	2	
5	MJD 11	IT5MJ11	Summer Internship	H	4			6
Total					20	25 Hours		

SIXTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 12	IT6MJ12	Computer Networks	H	4	3		2
2	MJD 13	IT6MJ13	Software Engineering Theory and Practice	H	4	3		2
3	MJD 14	IT6MJ14	System Modelling & Simulation	H	4	3		2
4	MJD 15	IT6MJ15	Web Engineering	H	4	3	2	
5	MID 6		Any one course from Table 1	S	4	3		2
Total					20	25 Hours		

SEVENTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 16	IT7MJ16	Software Testing and Quality Assurance	H	4	3		2
2	MJD 17	IT7MJ17	Distributed Systems	H	4	3		2
3	MJD 18	IT7MJ18	Wireless Communication Networks (5G)	H	4	3		2
4	MID 7		Any one course from Table 2	S	4	3		2
5	MID 8		Any one course from Table 3	S	4	3		2
Total					20	25 Hours		

EIGHTH SEMESTER B.Sc Information Technology (Honors)								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 19		Any one course from Table 4	S	4	3		2
2	MJD 20		Any one course from Table 5	S	4	3		2
3	MJD 21	IT8MJ21	Drone Technologies	H	4	3		2
4	MJD 22	IT8MJ22	Modern Networking	H	4	3		2
5	MJD 23	IT8MJ23	Storage Technologies	H	4	3		2
Total					20	25 Hours		

EIGHTH SEMESTER B.Sc Information Technology (Honors with Research)							
Compon ent	Course Code	Title of the Course	H/S	Credi ts	Hours/Week		
					L	T	P
MJD 19		Any one course from Table 4	S	4	3		2
MJD 20		Any one course from Table 5	S	4	3		2
MJD 21	IT8MJ24	Research Project	H	4			5
MJD 22	IT8MJ25	Project Report	H	4			5
MJD 23	IT8MJ26	Project Viva-Voce	H	4			5
Total				20	25 Hours		

Table 1: MID 6 – SIXTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MID 6	IT6MI06E1	Cloud Computing & IoT	S	4	3		2
2	MID 6	IT6MI06E2	5G Communication Technologies	S	4	3		2

Table 2: MID 7 – SEVENTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MID 7	IT7MI07E1	Data Center Management	S	4	3		2
2	MID 7	IT7MI07E2	AI & Machine Learning	S	4	3		2

Table 3: MID 8 – SEVENTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MID 8	IT7MI08E1	High Performance Computing	S	4	3		2
2	MID 8	IT7MI08E2	Cryptography & Cybersecurity	S	4	3		2
3	MID 8	IT7MI08E3	Software Testing and Quality Assurance	S	4	3		2

Table 4: MJD 19 – EIGHTH SEMESTER

S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 19	IT8MJ19E1	Big Data Technologies	S	4	3		2
2	MJD 19	IT8MJ19E2	Hadoop Ecosystem	S	4	3		2

Table 5: MJD 20 – EIGHTH SEMESTER

S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 20	IT8MJ20E1	Blockchain Technologies	S	4	3		2
2	MJD 20	IT8MJ20E2	IT Management Standards	S	4	3		2

Table 6: MJD 21 / MJD 22 / MJD 23 – EIGHTH SEMESTER

S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 21	IT8MJ21	Drone Technologies	H	4	3		2
2	MJD 22	IT8MJ22	Modern Networking	H	4	3		2
3	MJD 23	IT8MJ23	Storage Technologies	H	4	3		2

Table 7: SEC 1 / SEC 2 / SEC 3 – I / II / III SEMESTERS

S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	SEC 1	IT1SE01E1	Content Authoring Tools	S	3	3		2
2	SEC 1	IT1SE01E2	Introduction to Python Programming	S	3	3		2
3	SEC 2	IT2SE02E1	Web Designing and DTP tools	S	3	3		2
4	SEC 2	IT2SE02E2	Visual programming with C#	S	3	3		2
5	SEC 3	IT3SE03E1	Server Administration	S	3	3		2
6	SEC 3	IT3SE03E2	3D Modelling & Animation	S	3	3		2

Table 8: List of Major Disciplinary Courses

S.No	Component	Course Code	Title of the Course	H/S
1.	MJD 1	IT1MJ01	Digital Logic Fundamentals	H
2.	MJD 2	IT2MJ02	Problem Solving & Programming Fundamentals	H
3.	MJD 3	IT3MJ03	Mathematical Foundations of Computer Science	H
4.	MJD 4	IT3MJ04	Data Structures	H
5.	MJD 5	IT4MJ05	Computer System Architecture	H
6.	MJD 6	IT4MJ06	Design and Analysis of Algorithms	H
7.	MJD 7	IT4MJ07	Object Oriented Programming	H
8.	MJD 8	IT5MJ08	Operating Systems	H
9.	MJD 9	IT5MJ09	Database Management Systems	H
10.	MJD 10	IT5MJ10	Management Strategies & Concepts	H
11.	MJD 11	IT5MJ11	Summer Internship	H

12.	MJD 12	IT6MJ12	Computer Networks	H
13.	MJD 13	IT6MJ13	Software Engineering Theory and Practice	H
14.	MJD 14	IT6MJ14	System Modeling & Simulation	H
15.	MJD 15	IT6MJ15	Web Engineering	H
16.	MJD 16	IT7MJ16	Software Testing and Quality Assurance	H
17.	MJD 17	IT7MJ17	Distributed Systems	H
18.	MJD 18	IT7MJ18	Wireless Communication Networks (5G)	H
19.	MJD 19		Big Data Technologies / Hadoop Ecosystem	S
20.	MJD 20		Blockchain Technologies / IT Management Standards	S

Table 9: List of Minor Disciplinary Courses

S.No	Comp onent	Course Code	Title of the Course	H/S
1.	MID 1	IT1MI01	IT Essentials	S
2.	MID 2	IT2MI02	PC, Network and Mobile Troubleshooting	S
3.	MID 3	IT3MI03	Enterprise IT infrastructure	S
4.	MID 4	IT4MI04	Remote Infrastructure Management	S
5.	MID 5	IT5MI05	Network Protocols & Administration	S
6.	MID 6		Cloud Computing & IoT / 5G Communication Technologies	S
7.	MID 7		Data Center Management/ AI & Machine Learning	S
8.	MID 8		High Performance Computing / Cryptography & Cybersecurity/ Software Testing and Quality Assurance	S

Table 10: List of Multi-disciplinary Courses

S.No	Compo nent	Course Code	Title of the Course	H/S
1.	MLD 1	IT1ML01	Natural Sciences	H
2.	MLD 2	IT2ML02	Physical Sciences	H
3.	MLD 3	IT3ML03	Humanities & Social Sciences	H

Table 11: List of Ability Enhancement Courses

S.No	Comp onent	Course Code	Title of the Course	H/S
1.	AEC 1	IT1AE01	English I	H
2.	AEC 2	IT2AE02	Indian Language I	H
3.	AEC 3	IT3AE03	English II	H
3.	AEC 4	IT4AE04	Indian Language II	H

Table 12: List of Value-Added Courses

S.No	Component	Course Code	Title of the Course	H/S
1.	SEC 1	IT1SE01E1	Content Authoring Tools	S
2.	SEC 1	IT1SE01E2	Python Programming	S
3.	SEC 2	IT2SE02E1	Web Designing and DTP tools	S
4.	SEC 2	IT2SE02E2	Visual programming with C#	S
5.	SEC 3	IT3SE03E1	Server Administration	S
6.	SEC 3	IT3SE03E2	3D Modelling & Animation	S

Table 13: List of Skill Enhancement Courses

S.No	Component	Course Code	Title of the Course	H/S
1.	VAC 1	IT1VA01	Understanding India	H
2.	VAC 2	IT1VA02	Environmental Sciences / Education/ High Order Thinking	H
3.	VAC 3	IT2VA03	Health & Wellness / Yoga Education/ Universal Human Values	H
4.	VAC 4	IT2VA04	Digital Technologies	H

Table 14: Project (WP/ Internship)

S.No	Component	Course Code	Title of the Course	H/S
1.	Project	IT4CS01	Community Engagement and Service	H

***Table 15: MLD 1 / MLD 2 / MLD 3 in Sem 1 / Sem 2 / Sem 3**

S.No	Streams	Course Code	Title of the Course	H/S
1.	Natural Science		Biology	H
2.			Botany	H
3.			Zoology	H
4.			Biotechnology	H
5.			Biochemistry	H
6.	Physical Sciences		Chemistry	H
7.			Physics	H
8.			Biophysics	H
9.			Astronomy	H
10.			Astrophysics	H
11.			Earth and Environmental Sciences	H

12.	Social Sciences		Political Sciences	H
13.			History	H
14.			Social work	H
15.			Sociology	H
16.	Humanities		Anthropology	H
17.			Psychology	H
18.			Economics	H
19.	Computer Science & Applications	IT1SE01E2 (ODD)	Python Programming	H
20.		IT2MI02(EVEN)	PC, Network and Mobile Troubleshooting	H

*Courses will be announced after the approval of the respective boards.

SYLLABUS

SEMESTER I

Year	I	Course Code: IT1MJ01		Credits	4
Sem.	I	Course Title: Digital Logic Fundamentals		Hours	75
Course Prerequisites, if any	NIL				
Internal Assessment Marks: 25	End Semester Marks: 75		Duration of ESA (Theory): 03 hrs. Duration of ESA (Practical): 03 hrs.		
Course Outcomes	<ul style="list-style-type: none">• Understand the postulates of Boolean algebra.• Apply minimization techniques for combinational functions.• Design and analyze combinational and sequential circuits.• Analyze and apply techniques for the design of digital circuits.• Create simple digital circuit designs and schematics.				
Unit No.	Course Content			Hours	
Theory Component					
Unit I	Digital Systems and Binary Numbers Digital Systems - Binary Numbers - Number-Base Conversions - Octal and Hexadecimal Numbers - Complements of Numbers - Signed Binary Numbers - Binary Codes - Binary Storage and Registers - Binary Logic - Axiomatic Definition of Boolean Algebra - Basic Theorems and Properties of Boolean Algebra - Boolean Functions Canonical and Standard Forms - Other Logic Operations - Digital Logic Gates - Integrated Circuits			9	
Unit II	Gate-Level Minimization Introduction - The Map Method - Four-Variable K-Map - Product-of-Sums Simplification - Don't-Care Conditions - NAND and NOR Implementation - Other Two-Level Implementations - Exclusive-OR Function - Hardware Description Language			9	
Unit III	Combinational Logic Introduction - Combinational Circuits - Analysis Procedure - Design Procedure - Binary Adder–Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator – Decoders – Encoders – Multiplexers - HDL Models of Combinational Circuits.			9	
Unit IV	Synchronous Sequential Logic Introduction - Sequential Circuits - Storage Elements: Latches - Storage Elements: Flip-Flops - Analysis of Clocked Sequential Circuits - Synthesizable HDL Models of Sequential Circuits - State Reduction and Assignment - Design Procedure			9	
Unit V	Registers and Counters Registers - Shift Registers - Ripple Counters - Synchronous Counters - Other Counters - HDL for Registers and Counters			9	

Practical Component		
Exercises	<ol style="list-style-type: none"> 1. Binary to Decimal and vice-versa in Python 2. Decimal to Hexadecimal and Vice-Versa in Python 3. Digital Logic Gates in Python 4. Simplification of Boolean Functions in Python 5. Combinational Logic Circuits in Python <ol style="list-style-type: none"> i. Code Converters ii. Arithmetic (Adders, Subtractors, Multipliers, Comparators) iii. Data Handling (Multiplexers, Demultiplexers, Encoders & Decoders) 6. Combinational Logic Circuit Design in Python 7. Binary Adder-Subtractor Simulation in Python 8. Decimal Adder Simulation in Python 9. Binary Multiplier Simulation in Python 10. Sequential Circuit Storage Elements: Flip-Flop Simulation in Python <p>(Many more programs can be included related to programming the Digital logic in Python)</p>	30
Recommended Learning Resources		
Print Resources	<ol style="list-style-type: none"> 1. M. Morris Mano , Michael D. Ciletti, Digital design With an Introduction to the Verilog HDL, Pearson, Fifth Edition, 2013, ISBN-13: 978-0-13-277420-8, ISBN-10: 0-13-277420-8. 2. M. Rafiquzzaman, Fundamentals of Digital Logic and Microcomputer Design, John Wiley & Sons, Inc., Fifth Edition, 2005. 	

Year	I	Course Code: IT1MI01	Credits	4
Sem.	I		Course Title : IT Essentials	Hours
Course Prerequisites, if any	NIL			
Internal Assessment Marks: 25	End Semester Marks: 75		Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.	
Course Outcomes	<ul style="list-style-type: none">• Understand the components of IT infrastructure and configure them.• Learn to Install and configure proprietary and open-source Operating Systems• Design an infrastructure deployment as per specified requirements• Apply the basic knowledge of IT infrastructure for creating new deployments• Analyze the functions of IT infrastructure to optimize them			
Unit No.	Course Content		Hours	
Theory Component				
Unit I	IT CONCEPTS AND INFRASTRUCTURE Motherboards -Understanding Motherboards; Processors - Understanding Processors; Memory-Understanding Memory; Understanding Cooling System; Expansion Cards-Installing and Configuring Expansion Cards; Storage Devices-Understanding Storage Devices; Power Supplies-Understanding Power Supplies; Peripherals, Cables and Connectors-Understanding Peripheral, Cables and Connectors; Printers and Multifunction Devices-Understanding Print technologies and Imaging		9	

	Processes, Installing and Maintaining Printers.	
Unit II	OPERATING SYSTEMS AND APPLICATIONS Operating System Basics- Understanding Operating Systems, Terms and Concepts, System Requirements; Understanding Applications-Installation, Security Concerns, Other considerations; Introduction to Windows 10; Windows Configuration-Interacting with OS, Windows Registry, Disk Management; Windows Administration- Installing and Upgrading Windows, Command-line tools; Working with Linux-Basic Linux Commands, Linux and Windows.	9
Unit III	NETWORKING CONCEPTS Networking Fundamentals - Understanding Networking Principles, Identifying Common Network Hardware; Network Introduction to TCP/IP- Understanding TCP/IP, Understanding Virtual Networks.	9
Unit IV	WIRELESS NETWORKS AND NETWORK SERVICES Wireless and SOHO Networks- Understanding Wireless Networking Technologies, Installing and Configuring SOHO Networks; Network Services and Cloud Computing-Understanding Network Services, Understanding Cloud Computing- Concepts of Cloud Computing.	9
Unit V	MOBILE DEVICES AND CONNECTIVITY Working with Laptop and Mobile Device Hardware-Understanding the- Differences between Device Types, Disassembling and Reassembling Laptops, Installing and Configuring Laptop Hardware, Setting Up and Configuring Accessories and Ports; Mobile Connectivity and Application Support - Understanding Mobile Connectivity, Understanding Mobile App Support.	9
Practical Component		
Exercises	<ol style="list-style-type: none"> 1. Demonstrating disassembling a computer, explaining its various parts and reassembling it. 2. Installing printer and demonstrating successful printing of documents. 3. Demonstrating the installation and configuration of windows operating system. 4. Demonstrating the use of various windows command-line functions. 5. Demonstrating the installation of the linux operating system. 6. Demonstrating the use of basic linux commands. 7. Performing study of various networking hardware - routers, switches, etc. 8. Demonstrating the installation and configuration of routers, switches, etc 9. Demonstrating the creation of a SOHO network and configuring the same. 10. Creating an account in any cloud service provider. 11. Demonstrating the creation of infrastructure as a service by creating suitable computing configuration in the cloud. 12. Demonstrating the disassembling of laptops, explaining its parts and reassembling of laptops. 	30

	13. Demonstrating the disassembling of a mobile phone, explaining its parts and reassembling it.	
Recommended Learning Resources		
Print Resources	1. Quentin Docter, Jon Buhagiar, "CompTia A+ COMPLETE study GUIDE" core 1 exam 220-1101 and core 2 exam 220-1102 Wiley Sybex Publication, 2022 2. Mike Meyers, "CompTIA A+ Certification All-in-One Exam Guide", Tenth Edition (Exams 220-1001 & 220-1002)-McGraw-Hill Education 2019.	

Skill Enhancement Courses

Year	I	Course Code: IT1SE01E1		Credits	3
Sem.	I	Course Title: Content Authoring Tools		Hours	60
Course Prerequisites, if any	NIL				
Internal Assessment Marks: 50	End Semester Marks: 50		Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	<ul style="list-style-type: none">Understand the key features of content authoring tools.Learn to Install and use Open source and commercial image authoring tools.Demonstrate the ability to use various content authoring tools to create engaging and interactive content.Analyse the impact of design choices on user engagement and learning outcomes using the various mind mapping tool.Design and produce multimedia content using interactive content authoring tools to enhance creativity and interactivity.				
Unit No.	Course Content			Hours	
Theory Component					
Unit I	Introduction Authoring Tools Introduction - Classification of Authoring tools: Web Authoring tools - Media and Application tools - Course authoring tools - Features of Authoring tools - Elements of Authoring tools .			6	
Unit II	Image Authoring tools Introduction to various Image authoring tools - Open source vs commercial authoring tools - Image enhancing with Open Source Tools : GIMP features.			6	
Unit III	Audio & Video Authoring Tools Audio : Recording basics - Open Source Tools - A case study with Audacity - Video Types - Video features - Screen recording - Open Broadcaster Software studio : Features - Recording - Streaming - Mobile specific video features.			6	
Unit IV	Mind Maps Mind Maps : Introduction - Comparative analysis of various mind mapping tools - Xmind : Building various types of mindmaps - Features - Exporting.			6	
Unit V	Interactive Content Authoring Introduction to Interactive content building - H5P : Use cases - Building Interactive presentation - Building flash cards - Interactive Videos - Building interactive 360 degree virtual tours			6	
Practical Component					

Exercises	<ol style="list-style-type: none"> 1. Perform a survey on various types of authoring tools 2. Design a banner highlighting features of your department. 3. Enhance an input image by applying various filters. 4. Build a podcast on a specific topic. 5. Enhance an audio file by removing various types of noises. 6. Build your video resume in 3 different styles. 7. Build mind maps of the courses that you are studying in this semester 8. Create an interactive video about your department. 9. Using H5P build interactive content. 10. Case Study: Build a multimedia placement brochure for your department. 	30
Recommended Learning Resources		
Print Resources	<ol style="list-style-type: none"> 1. Diane Elkins "E-Learning Fundamentals: A Practical Guide", 2015 2. Tony Buzan, "Mind Map Mastery: The Complete Guide to Learning and Using the Most Powerful Thinking Tool in the Universe", 2018. 	

Year	I	Course Code: IT1SE01E2		Credits	3
Sem.	I	Course Title : Python Programming		Hours	60
Course Prerequisites, if any	Basic Knowledge in Programming Concepts				
Internal Assessment Marks: 50	End Semester Marks: 50		Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	<ul style="list-style-type: none">Understand the basics of writing Python codeImplement programs using lists, tuples and dictionariesUnderstand the use of control structuresAbility to write programs using packagesUnderstand the file manipulation				
Unit No.	Course Content			Hours	
Theory Component					
Unit I	Introduction, Data types Introduction to Python – Advantages of using Python – Executing Python Programs – Python’s Core data types – Numeric Types – String Fundamentals.			6	
Unit II	Lists, Tuples, Dictionaries Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.			6	
Unit III	Control Flow, Functions, Modules Python Statements: Assignments – Expressions – If condition – While and For Loops. Functions: Definition, Calls – Scopes – Arguments – Recursive Functions– Functional Programming tools. Classes and Object Oriented programming with Python - Modules and Packages: Purpose, using packages– Exception Handling with Python.			6	
Unit IV	Packages Packages: NumPy, Pandas, Scikit learn - Machine learning with Python – Cleaning up, Wrangling, Analysis, Visualization - Matplotlib package – Plotting Graphs.			6	
Unit V	File Handling Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions			6	
Practical Component					

Exercises	<ol style="list-style-type: none"> 1. Exchange the values of two variables 2. Finding minimum among n variables 3. Perform Simple sorting 4. Generate Students marks statement 5. Find square root, GCD, exponentiation 6. Sum the array of numbers 7. Perform linear search, binary search 8. Perform Matrix operations using NumPy 9. Perform Dataframe operations using Pandas 10. Use Matplotlib on dataset and visualise 11. Perform Word count, copy file operations 	30
Recommended Learning Resources		
Print Resources	<ol style="list-style-type: none"> 1. Mark Lutz, "Learning Python", Fifth Edition, O'Reilly, 2013. 2. Daniel Liang, "Introduction to programming using Python", Pearson, First edition, 2021. 3. Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media, 2012. 4. Tim Hall and J-P Stacey, "Python 3 for Absolute Beginners", Apress, First Edition, 2009. 5. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", Apress, Second Edition, 2005. 	

SEMESTER II

Year	I	Course Code: IT2MJ02	Credits	4
Sem.	II	Course Title: Problem Solving & Programming Fundamentals	Hours	75
Course Prerequisites, if any	NIL			
Internal Assessment Marks: 25	End Semester Marks: 75		Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.	
Course Outcomes	<ul style="list-style-type: none">Understand the basic concepts of programming languages, including syntax and semantics.Apply programming constructs like loops, conditionals, and functions in practical scenarios.Analyze code to identify and fix errors using debugging techniques.Create modular programs using functions and procedures, emphasizing good programming practices.			
Unit No.	Course Content			Hours
Theory Component				
Unit I	Introduction to Computer Problem-Solving The Problem-solving Aspect - Top-down Design - Implementation of Algorithms - Program Verification - The Efficiency of Algorithms - The Analysis of Algorithms			9
Unit II	Basic programming constructs Basic Data types (Numerical, String) – Variables – Expressions – I/O statements – Compile and Run - Debugging.			9
Unit III	Decision Making – Branching & Looping Decision making – Relational Operators - Conditional statement, Looping statement - Nested loops - Infinite loops - Switch statements.			9
Unit IV	Array Techniques Array Manipulation - Different operations - one dimensional array - two-dimensional array - multi-dimensional array - Character Arrays and Strings.			9
Unit V	Modular solutions Introduction to functions – Importance of design of functions – Arguments – Parameters – return values – local and global scope – Recursion.			9
Practical Component				
Exercises	1. Program to array counting, array order reversal & find the maximum number in a set. 2. Program for removal of duplicates from an ordered array & to partition an array. 3. Program to find the k th smallest element. 4. Program to exchange the values of two variables without using a third variable. 5. Program that takes a list of numbers as input and counts the total number of elements in the list. 6. Program to calculate the sum of a set of numbers entered by the user. 7. Program to compute the factorial of a given integer.			30

	<ol style="list-style-type: none"> 8. Program to compute the sine of an angle (in degrees) using a series expansion. 9. Program to generate the Fibonacci sequence up to a specified limit. 10. Program that takes an integer as input and reverses its digits. 11. Program that converts a number from one base to another (e.g., binary to decimal, decimal to binary). 	
Recommended Learning Resources		
Print Resources	<p>1. R. G. Dromey, "How to solve it by Computer", Pearson Education, 2007.</p> <p>2. E. Balaguruswamy, "Programming In ANSI C", 4th edition, TMH Publications, 2007.</p> <p>3. Yashwant Kanetkar, "Let Us C", 13th Edition, PHP, 2013.</p> <p>4. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.</p>	

Year	I	Course Code: IT2MI02	Credits	4
Sem.	II		Course Title : PC, Network, and Mobile Device Troubleshooting	Hours
Course Prerequisites, if any	NIL			
Internal Assessment Marks: 25	End Semester Marks: 75		Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.	
Course Outcomes	<ul style="list-style-type: none">Understand the common hardware and software issues in PCs, networks, and mobile devices.Learn the principles of troubleshooting in PCs, Operating system, networks, and mobile devices.Apply diagnostic tools and techniques to identify and resolve hardware and software problems on PCs, networks, and mobile devices.Evaluate the security implications of various troubleshooting actions on PCs, networks, and mobile devices.Design and implement preventive maintenance plans to minimize future technical issues.			
Unit No.	Course Content		Hours	
Theory Component				
Unit I	TROUBLESHOOTING METHODOLOGY AND RESOLVING CORE HARDWARE PROBLEMS Using the Troubleshooting Best Practice Methodology, Troubleshooting Motherboards, CPUs, RAM, and Power Problems, Troubleshooting Storage Devices and RAID Arrays, Troubleshooting Video, Projector, and Display Issues, Troubleshooting Printers Problems, Troubleshooting Common Mobile Device Issues.		9	
Unit II	SECURITY ISSUES FOR TROUBLESHOOTING Security Concepts - Physical Security Concepts, Physical Security for Staff, Logical Security, Malware, Mitigating Software Threats, Social Engineering Attacks, Threats and Vulnerabilities, Common Security Threats, Security Best Practices, Best Practices for Malware Removal.		9	
Unit III	NETWORK TROUBLESHOOTING Troubleshooting Networking Problems -Using Network Troubleshooting Tools, Resolving Connectivity Issues, Repairing Physical Cabling, Fixing Common Problems, Troubleshooting Wi-Fi- Hardware Troubleshooting, Software Troubleshooting, Connectivity Troubleshooting, Configuring Troubleshooting, securing a SOHO Network (Wireless), Securing a SOHO Network (Wired)		9	

Unit IV	TROUBLESHOOTING OPERATING SYSTEM Troubleshooting Common OS Problems- Common Symptoms, Common Troubleshooting Steps, Troubleshooting Security Issues - Common Symptoms, Browser Related Symptoms, Working with Windows OS Security Settings-Users and Groups, User Authentication, NTFS vs. Share Permissions, Shared Files and Folders, System Files and Folders, Windows Security Features - Web Browser Security-Browser Download and Installation, Extension and Plug-ins, Credentials Managers, Secure Data Transfer.	9
Unit V	MOBILE DEVICE TROUBLESHOOTING Mobile Device Security, Troubleshooting Mobile OS Issues-Application Problems Performance Issues, OS Fails to Update Extremely Short Battery Life, Connectivity Issues, Auto Rotate Issues, Troubleshooting Mobile Security Issues-Security Concerns, Common Symptoms.	9
Practical Component		
Exercises	<ol style="list-style-type: none"> 1. Demonstrating the troubleshooting of motherboards, CPUs, RAM, power problems, Storage Devices. 2. Demonstrating the troubleshooting of RAID Arrays, Video, Projector, and Display Issues. 3. Demonstrating the troubleshooting of Printer Problems, Common Mobile Device Issues. 4. Demonstrating the mitigation of common security threats using appropriate software. 5. Demonstrating the troubleshooting of Networking Problems using Network Troubleshooting Tools. 6. Demonstrating the troubleshooting of Resolving Connectivity Issues, Repairing Physical Cabling, Fixing Common Problems. 7. Demonstrating the troubleshooting of Wi-Fi-Hardware Troubleshooting, Software Troubleshooting. 8. Demonstrating troubleshooting Common OS Problems Troubleshooting Security Issues, Browser issues. 9. Working with Windows OS Security Settings, Creating Users and Groups, setting up user Authentication, creating NTFS vs. Share file Permissions. 10. Configuring Windows Security Features configuring Web Browser Security, Browser Download and Installation, Extension and Plug-ins 11. Demonstrating troubleshooting of Mobile OS Issues, Application Problems, Performance Issues. 12. Demonstrating troubleshooting of OS Update failure, Extremely Short Battery Life, Connectivity Issues, Auto Rotate Issues, Mobile Security Issues. 	30

Recommended Learning Resources	
Print Resources	<ol style="list-style-type: none"> 1. Quentin Docter, Jon Buhagiar, "COMPTIA A+ COMPLETE study GUIDE", (core 1 exam 220-1101 and core 2 exam 220-1102), WILEY-SYBEX, 2022 2. Meyers, "CompTIA A+ Certification All-in-One Exam Guide", Tenth Edition (Exams 220-1001 & 220-1002)-McGraw-Hill Education 2019

SKILL ENHANCEMENT COURSES

Year	I	Course Code: IT2SE02E1	Credits	3
Sem.	II		Hours	60
		Course Title : Web Designing and Desktop Publishing Tools		
Course Prerequisites, if any	Basic knowledge of computers			
Internal Assessment Marks: 50	End Semester Marks: 50		Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.	
Course Outcomes	<ul style="list-style-type: none">Understand the fundamental concepts related to the Internet and web design principles.Learn the process of digital illustration for content creation and website hosting.Demonstrate the use of various web designing and desktop publishing tools to create engaging and interactive design.Analyse the usage of document editing tools for various applications.Design and develop a fully functional and aesthetically pleasing website, brochures, newsletters, resumes, certificates, etc., employing appropriate design tools effectively.			
Unit No.	Course Content		Hours	
Theory Component				
Unit I	Basics of Web Designing and Internet Design a website/blog, creating different themes for different layouts, designing the look and feel of a website, creating and designing banners, advertisements, basics of networks and internet, working with email and online tools for conversion and compression.		6	
Unit II	Digital Illustration and Hosting Electronic Image Creation and Manipulation, Image Scanning, Colour Model, Graphic Reduction Illustration, Creating Graphic Realism, illustrating children’s books, CDs, vector characters or concept art specialise - hosting website & uploading ftp : file transfer protocol - hosting plan, hosting domains on Cpanel, using Cpanel create emails of any domain, pointing name servers to the domains, live domain registration, assigning web mails, creating pop mails, control panel features, buy hosting plans.		6	
Unit III	Photoshop/GIMP Introduction, Basic Image Manipulation, Color Painting Tools, Brush Settings, Making Selections, Filling and stroking, Layers, Advanced Layers, Text, Drawing, Using Channels and Masking, Manipulating images, Getting to know the work area, Using Adobe Bridge, Basic Photo Corrections, Retouching and Repairing, Working with selections, Layer Basics, Masks and channels, Correcting and enhancing digital photographs, Topographic design, Vector drawing techniques, Advanced Layer techniques, Vector Composting, Creating Links within an image,		6	

	Creating rollover web visuals, Animating GIF images for the web, Producing and printing consistent color.	
Unit IV	PageMaker/Scribus Introduction, PageMaker Interface, Creating a New Document, Managing Document Layer, Creating & Editing Text, Working with Edit Story, Managing Text as an Object, Working with Text and Graphics, Using Graphics, Applying Colors to Graphics, Framing Graphics, Cropping and masking Graphics, Working with Layers, Working with Master pages, Working with Plugins, Using Text Wrap, Using Advanced Features, Creating a PDF Document in PageMaker, Working with Data Merger, Using Scripts, Using Object Linking and Embedding, Color Separation Capabilities, Printing.	6
Unit V	Coral Draw/Inkscape/Canva Introduction to Corel Draw, Features of Corel Draw, Corel Draw Interface, Tool Box, Moving from Adobe Illustrator to Corel Draw, Common Tasks, Drawing and Coloring, Selecting Objects, Creating Basic Shapes, Reshaping Objects, Organizing objects, Applying color fills and Outlines, Mastering with Text, Text Tool Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects, Applying Effects, Power of Blends Distortion, Contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects, Power Clips, Working with Bitmap Commands, Working with Bitmaps, Editing Bitmaps, Applying effects on Bitmaps, Printing, Corel Draw- Web resources, Internet Tool bar, Setting your webpage, Exporting files, Creating buttons with rollover effects.	6
Practical Component		
Exercises	<ol style="list-style-type: none"> 1. Learning about tools like Google web designer, webflow, wordpress, Adobe Dreamweaver etc. 2. Designing an interactive web page or blog. - Sending emails with image and text attachments. 3. Working with E-Publishing, E-Books preparation tools. 4. Learning and applying concepts and techniques for vector-based symbols and illustrations. 5. Designing Business card, hosting website, domain registration. 6. Create your own visiting card and letterhead including your own style and logo, showing cutting mark and colour registration, symbol and take a print by using any colour printer. 7. Create at least one banner and one poster on "skill development" theme. 8. Creating regional language magazine showing column structure and inserting properly edited appropriate picture within magazine. 9. Designing an attractive and theme oriented regional language magazine front page. 	30

	10. Designing Monograms, Logos, Advertisements, Brochure etc.	
Recommended Learning Resources		
Print Resources	<ol style="list-style-type: none"> 1. "ADOBE® DREAMWEAVER® Help and tutorials", Dreamweaver Creative Cloud, Adobe publication, 2014 2. Stephanie Leary, "Wordpress for web developer", Apress, 2013 3. "Adobe Photoshop CC Classroom in a Book" Adobe creative team, Adobe press, 2018 4. "Adobe PageMaker 7.0 Classroom in a Book" – Adobe creative team, Adobe press, 2001 5. Gary David Bouton, "CorelDraw X8: The official guide", McGraw-Hill, 2017 6. Satish Jain, "BPB DTP Course Paperback – 1", BPB Publication, 2014 	

Year	I	Course Code: IT1SE02E2		Credits	3
Sem.	II	Course Title: Visual Programming using C#		Hours	60
Course Prerequisites, if any	Basic knowledge of computer Programming				
Internal Assessment Marks: 50	End Semester Marks: 50		Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	<ul style="list-style-type: none">Understand the key components of the .NET Framework related to C# development.Learn the basic syntax and structure of C# programs.Design C# applications by integrating various object-oriented programming techniques in .NET framework.Analyze the significance of graphical user interface (GUI) components and the Event Handling Model using C# programming.Create robust, scalable database applications using ADO.NET connectivity.				
Unit No.	Course Content			Hours	
Theory Component					
Unit I	Introduction to .Net Framework An Overview - Framework Components - The Common Language Runtime (CLR) - .NET Base Class Library - Common Language Specification (CLS) - Common Type System (CTS) - Metadata and Assemblies - .NET Namespaces - MSIL - JIT Compilers.			6	
Unit II	Overview of C# Program structure, Literals, Variables, Constants, Data Types, Operators, Statements and Expressions, Branching, Looping and loop control statements, Arrays, Strings manipulation, Boxing and Unboxing, Pre-processors, Namespaces.			6	
Unit III	Object Oriented Programming in C# Class, Objects, Encapsulation, Constructors and its types, Inheritance, Polymorphism. Interface, Abstract class, Operator overloading, Properties, Indexers, Delegates, Collections.			6	
Unit IV	Windows Forms Introduction to Windows Forms and various controls, SDI and MDI applications, Menu Creation, Common Dialog Boxes. Events and event handling.			6	
Unit V	Introduction to ADO.NET ADO.NET Architecture - Connection Object - Command Object - Dataset - Data Reader Object - Data Adapter Object- Data Table - Datagridview and Data Binding. Connecting to a database and OLE DB data source, Adding, updating, deleting, and viewing records in the database.			6	
Practical Component					
Exercises	1. Installation of Visual Studio and creation of Simple console Application. 2. Create simple C# program for the following concepts: a. To Check whether the given number is Prime or not b. To Check whether the given number is Armstrong or not c. To demonstrate Pascal's Triangle			30	

	<ul style="list-style-type: none"> d. To Check whether the alphabet is a vowel or not using switch..case. e. To Check whether the given string is palindrome or not using arrays. <ol style="list-style-type: none"> 3. Create a program to demonstrate boxing and unboxing operations. 4. Implement Classes and Objects, Inheritance & Polymorphism 5. Implement Interfaces and Operator Overloading. 6. Create a GUI using standard controls, SDI & MDI forms. 7. Design an application with menu options and Common Dialog box. 8. Design a database application using Database Controls 9. Design an ADO database and perform the operations of insertion, modification, deletion, and viewing. 10. Develop any TWO case studies listed below: <ul style="list-style-type: none"> a. Inventory Control b. Retail Shop Management c. Employee Information System d. Personal Assistant Program e. Students' Information System 	
Recommended Learning Resources		
Print Resources	<ol style="list-style-type: none"> 1. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012. 2. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012. 3. Andrew Troelsen, "Pro C# 2010 and the .NET 4 Platform", Fifth edition, A Press, 2010. 4. Ian Griffiths, Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O'Reilly, 2010. 	

Year	I	Course Code: IT2VA04		Credits	2
Sem.	II	Course Title: Digital Technologies		Hours	45
Course Prerequisites, if any	NIL				
Internal Assessment Marks: 25	End Semester Marks: 75		Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	<ul style="list-style-type: none">Understand the importance of digital technology, digital financial tools, e-commerce.Analyse the concepts of communication and networks.Understand the e-governance and Digital India initiatives.Understand the use & applications of digital technology.Explore the applications of machine learning and big data.				
Unit No.	Course Content			Hours	
Theory Component					
Unit I	Introduction & Evolution of Digital Systems. Role & Significance of Digital Technology. Information & Communication Technology & Tools. Computer System & its working, Software and its types. Operating Systems: Types and Functions. Problem Solving: Algorithms and Flowcharts.			7	
Unit II	Communication Systems: Principles, Model & Transmission Media. Computer Networks & Internet: Concepts & Applications, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking. Computer Based Information System: Significance & Types. E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges.			7	
Unit III	Digital India & e-Governance: Initiatives, Infrastructure, Services and Empowerment. Digital Financial Tools: Unified Payment Interface, Aadhar Enabled Payment System, USSD, Credit / Debit Cards, e-Wallets, Internet Banking, NEFT/RTGS and IMPS, Online Bill Payments and PoS. Cyber Security: Threats, Significance, Challenges, Precautions, Safety Measures, & Tools, legal and ethical perspectives.			7	
Unit IV	Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, Internet of Things, Virtual Reality,			7	

Unit V	Emerging Technologies & their applications: Blockchain & Cryptocurrency, Robotics, Machine Learning & Artificial Intelligence, 3-D Printing. Digital Signatures.	7
Practical Component		
Exercises	<ol style="list-style-type: none"> 1. Operating System Installation and configuration 2. Application Software Installation and configuration 3. Hardware understanding and minor troubleshooting 4. Networking, cabling, configuration 	10
Recommended Learning Resources		
Print Resources	<ol style="list-style-type: none"> 1. Pramod Kumar, Anuradha Tomar, R. Sharmila, "Emerging Technologies in Computing - Theory, Practice, and Advances", Chapman and Hall / CRC, 1st Edition, 2021, eBook ISBN: 9781003121466. https://doi.org/10.1201/9781003121466. 2. V. Rajaraman, "Introduction to Information Technology", PHI, 3rd Edition, 2018, ISBN-10: 9387472299, ISBN-13: 978-9387472297. 3. E. Balagurusamy, "Fundamentals of Computers", Tata Mc GrawHill, 2nd Edition, 2011, ISBN: 9780071077880. 4. Behrouz A. Forouzan, "Data Communications and Networking", McGraw Hill, 4th Edition, 2007, ISBN 978-0-07-296775-3. 5. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, "Cloud Computing-Principals and Paradigms", Wiley, 2011, ISBN: 978-0-470-88799-8. 6. Stuart Russel and Peter Norvig, "Artificial Intelligence - A Modern Approach", Pearson Education, 3rd Edition, 2010, ISBN- 13: 978-0-13 -604259-4. 7. Samuel Greengard, "Internet of Things", The MIT Press, 2015, ISBN: 9780262328937, https://doi.org/10.7551/mitpress/10277.001.0001. 8. C.S.V. Murthy, "E- Commerce – Concept, Models &Strategies", Himalaya Publishing House, 2015, ISBN: 8178662760. 9. Hurwith, Nugent Halper, Kaufman, "Big Data for Dummies", Wiley & Sons, 1st Edition, 2013, ISBN-13: 978-1118504222. 	