SHRI GURU RAM RAI UNIVERSITY

Patel Nagar, Dehradun-248001, Uttarakhand, India

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]

Minutes of Meeting of Seventh Board of Studies Meeting held at Department of Information Technology, School of Engineering & Technology on 19-07-2025

Ref. SGRRU/SET/ 2025/056
Date of Meeting: 19th July, 2025 Time: 11.00 a.m.
Venue: Seminar Hall, SE&T

Meeting Presided by: Prof. (Dr.) Sonika Kandari, Dean, School of Engineering & Technology.

Minutes of Meeting Prepared by: Mr. Vaibhav Sharma, HoD, Department of IT, School of Engineering & Technology.

The Seventh Board of Studies(BoS) Meeting for Department of Information Technology, School of Engineering & Technology was called by Dr. Sonika Kandari, Chairman of BoS, Dean, School of Engineering & Technology, SGRR University, Dehradun on 19th July, 2025 to discuss following agendas:

Agenda Items of the Meeting:

1. Confirmation of minutes of 6th Board of Studies (BoS) Meeting.
2. Curriculum enhancement in accordance of NEP 2020 scheme into Discipline Core, Discipline Elective, Generic Electives, Skill Enhancement, Ability Enhancement and Value-Addition Courses for the Program B.Sc. IT.
3. Discussion on MOOCs course to be incorporated to provide flexibility in Curriculum.
4. To Discuss Exit policy Framework.
5. To discuss the Program Structure of B.Sc.IT 3 year/4 year Honours/Honours with Research Program.
6. Discussion on Implementation of One Full Semester (VI Semester) for Project in B.Sc.IT and Research Project in VIII Semester of B.Sc.IT (Honors with Research).
7. To discuss on Program Outcomes (POs), Course Outcomes (COs) & their Mapping.
8. To discuss the Examination and Evaluation Scheme.
9. Any other item with the permission of Chair.

The following BoS Panel Members were present in the meeting:

BoS Panel

1. Prof. (Dr.) Sonika Kandari, Dean, SET Chairman BoS
2. Prof (Dr.) MMS Rauthan,Professor, HNB Garhwal University , External Expert
3. Dr. Ashish Negi, Professor, GB Pant Engineering College, Pauri Garhwal, External Expert
4. Mrs. Shalu Pundir,Senior Software Developer, TCS, Industry Expert.
5. Prof. (Dr.) Harsh Kumar, Head, Professor, Member
6. Dr. G.D. Makkar, Associate Professor, Member
7. Mr. Harish Sharma, Associate Professor, Member
8. Ms. Minit Arora, Associate Professor, Member
9. Dr. Shalini Rawat, Assistant Professor, Member
10. Dr. Aakanksha Devrari, Assistant Professor, Member
11. Mr. Abhishek Singh, Alumni Representative
12. Ms Supriya Raturi, PhD Research Scholar, student representative
13. Mr Aman Singh Rawat, PhD Research Scholar, student representative
14. Ms Kashish Garg , BTech III Semester, student representative
15. Suresh Pokhrail, MCA III Semester student representative
16. Ms Vaishali Singhal, MCA I Semester, Student Representative
17. Mr. Vaibhav Sharma, Head, Department of Information Technology, Member Secretary,BoS

Agendas Discussed:

Dr. Sonika Kandari, Chairman BoS, warmly greeted the Members for their presence at the Seventh Board of Studies (BoS) Meeting of Department of Information Technology. The Chairman also extended sincere gratitude to External Experts for taking the time out of their busy schedules to attend the meeting.

Head, Department of IT, School of Engineering & Technology, SGRR University introduced the members and provide a concise overview of the proposed Curriculum for the B.Sc.IT Program.

Brief Profile and Progress of the School and Department was also highlighted.

With the kind permission of the chair, the following agendas were discussed:

Agenda 1: Confirmation of Minutes of 6th Board of Studies (BoS) Meeting

Resolution: HoD, IT updated the Board Members on the proceedings of the previous meeting (6th BoS) held on 3rd July, 2023 which was unanimously accepted as proposed.

Agenda 2: Curriculum Enhancement in accordance of NEP 2020 scheme into Discipline Core, Discipline Elective, Generic Electives, Skill Enhancement, Ability Enhancement and Value-Addition Courses for the Program B.Sc. IT.

Resolution: HoD IT conveyed to the Committee Members that B.Sc. IT Program incorporates new courses into existing Curriculum including Discipline Specific Core, Discipline Specific Elective, Generic Electives, Skill Enhancement, Ability Enhancement and Value-addition courses. These course are categorized in accordance with the NEP 2020.

The proposed new courses for the program have been allocated Specific Codes and Credits, which are listed as follows:

S. No.	Category of Course	Course Code	Course Name	Semester	Credits
1	Skill Enhancement	BITSC201	Indian Knowledge System	2	2
2	Value Addition Course	CITVC301	Introduction to Data Science	3	2
3	Value Addition Course	CITVC401	Big Data Analytics	2	2
4.	Project	BITP61	Project	6	12
5.	Discipline Specific Core	BITDSC701	Data Science Using Python	7	3
6.	Discipline Specific Core	BITP71	Lab-Data Science Using Python	7	1
7.	Discipline Specific Elective	BITDSE703B	Data Analysis With R/MOOC	7	4
8.	Discipline Specific Elective	BITDSE704A	Optimization technique in machine Learning/MOOC	7	4
9.	Discipline	BITDSC801	Machine Learning	8	3

	Specific Core		using Python		
10.	Discipline Specific Elective	BITDSE802B	Data and Visual Analytics in AI	8	3
11.	Discipline Specific Elective	BITDSE803A	Generative AI	8	4
12.	Discipline Specific Elective	BITDSE803B	Deep Learning	8	4
13.	Discipline Specific Elective	BITDSE803C	Introduction Blockchain	8	4
14.	Discipline Specific Core	BITP81	Advance Machine Learning Lab	8	1
15.	Research Project	BITP82	Dissertation(For Research Track)	8	18

A student has the option to select a Generic Elective Course from the generic elective basket offered by the University (within School / Other Schools of University)

Ability Enhancement Courses (AEC) courses - are taken in the first four semesters of the BSc IT Program.
These courses have been deemed relevant and beneficial for the students' for subject knowledge and professional competency.
The suggestions were accepted with minor corrections as proposed.

Agenda 3: Discussion on MOOCs course to be incorporated to provide flexibility in Curriculum

Resolution:

As per the discussion, MOOCs Courses are provided as substitute of Discipline Specific Elective Courses allowing students to select a MOOC Course of their choice instead of Discipline Elective subject offered in Vth to the VIII Semester. Experts suggested that MOOCs courses opted by students should be approved by Department and the duration of the course must be 12 weeks for 4 credits course and 8 weeks for 3 Credits Course provided that Students must submit their MOOC Course Completion Certificate/ Score Card to the Department. If a student either fails to submit Course Completion Certificate for MOOCs Course, he/she will be allowed to appear for the examination of concerned Discipline Specific Elective course conducted by the University.
A student will be allowed to opt for only one MOOC course in a Semester (where applicable). Irrespective of student being registered to the MOOCs course or not for any

Discipline Specific Elective Course, he/she will be allowed to appear for the University End Semester Examination.

Agenda 4: Exit policy Framework
Resolution:

HoD, IT explain existing Exit Policy Framework in detail and approved by committee as proposed.

S. No.	Name of Program	Duration of the program	Remarks
1	**Certificate in Information Technology** after completing 1 year (2 semesters) of study	1 Year	Students who opt to exit after completion of the first year and have secured **44 credits** will be awarded a UG certificate if, in addition, they complete one vocational course/Internship of **4 credits** during the summer vacation of the first year. These students are allowed to re-enter the degree program within three years and complete the degree program within the stipulated maximum period of seven years
2	**Diploma in Information Technology** after 2 years (4 semesters) of study	2 Years	Students who opt to exit after completion of the second year and have secured **88 credits** will be awarded the UG diploma if, in addition, they complete one vocational course/Internship of **4 credits** during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree program within the maximum period of seven years.
3	**Bachelor of Science in Information Technology** after 3-year (6 semesters) program of study	3 Years	Students who wish to undergo a 3-year UG program will be awarded UG Degree, **Bachelor of Science in Information Technology** in the Major discipline after successful completion of three years, securing **122 credits**.
4	**Bachelor of Science in Information Technology (Honours / Honours with Research)** after 4 years (8 semester) program of study	4 Years	A four-year UG honors degree **(Bachelor of Science in Information Technology (Honors) / (Honours with Research)** in the major discipline will be awarded to those who complete a four-year degree program with **162 credits**.

Agenda 5: To discuss the Program Structure of BScIT 3 years/4 year Honours/Honours with Research Program.

Resolution: HoD, IT informed the Committee Members about regular B.Sc. IT, 3 years undergraduate program and B.Sc. IT (Honour) /B.Sc. IT (Honours with Research) with 4 years duration. Suggestion incorporated into curriculum as suggested by External Experts

1.) Unit -2 Vedic Mathematics included into Syllabus of Subject- Indian Knowledge System, BITSC201 (II Semester)

2.) Applets were removed from Java Programming BITDSC401 (IV Sem) syllabus, and AWT and swings introduced in detail.

3) The syllabus of C#.Net BITDSC501 (V Sem) modified to include five units by separating database connectivity and Windows Applications into last two units.

4) Academic Project and Research Project related guidelines finalized as mentioned in Curriculum

All members agreed on Program Structure as proposed. (Attached as annexure-1)

Agenda 6: Discussion on Implementation of One Full Semester (VI Semester) for Project in B.Sc.IT and Research Project in VIII Semester of B.Sc.IT (Honors with Research).

Resolution:

The Committee unanimously approved the introduction of Full One Semester Project as part of the Curriculum in B.Sc.IT VI Semester and Research Project in of B.Sc.IT (Honors with Research) VIII Semester. The Project may be undertaken either within the university or in collaboration with an Industry . The inclusion of this component aims to provide students with practical exposure to real-world work environments. It is expected to bridge the gap between Academic and Industry by enabling students to apply their theoretical knowledge to real life projects. This initiative will enhance their understanding of software development processes, including system analysis, design, testing, deployment, and maintenance. Research Project will enhance the Research Aptitude of Students further enabling them for critical thinking on latest emerging research trends in their respective domains.

Agenda 7: To discuss on Program Outcomes (POs), Course Outcomes (COs) & their Mappings.

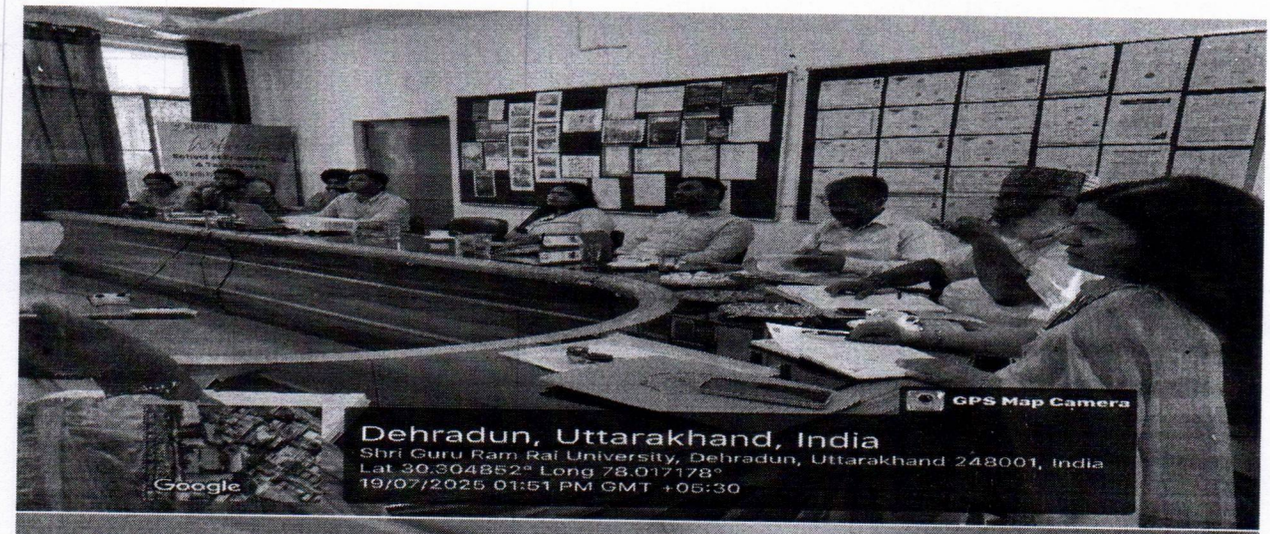
Resolutions:

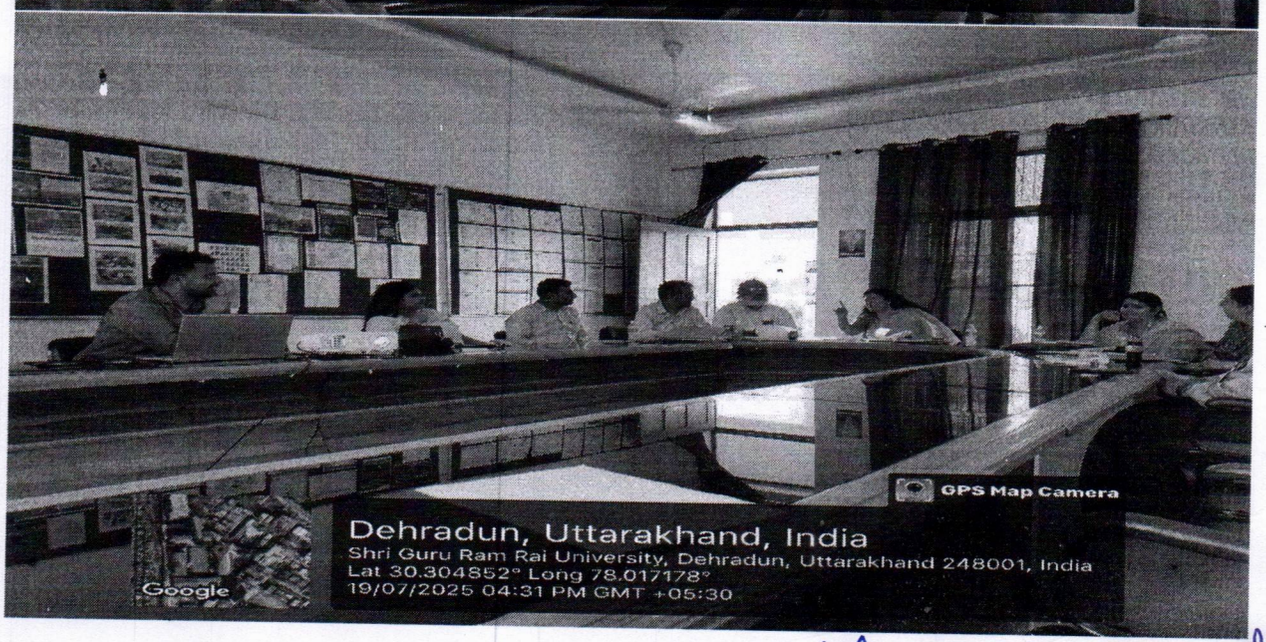
All members of the Committee agreed on redefining the Program Outcomes (POs) and Course Outcomes (COs) for discussed courses. For every course, relevant and appropriate Course Outcomes (COs) have been modified as per the suggestions of Board Members reflecting justification of overall Course Outcomes of BSc IT Program.

Agenda 8: To discuss the Examination and Evaluation Scheme.

Resolution:
All members unanimously agreed that the medium of instruction and examination for B.Sc. IT program would be English. The members agreed to follow the question paper pattern, examination duration, and the allocation of internal and external marks (End Semester Examination - ESE) as per the norms and guidelines set by SGRR University, as provided by University Examination Ordinance.

Agenda 9: Any other item with the permission of Chair.
Resolution:
With no further points remaining for discussion, the Chairman concluded the meeting with vote of thanks.





Signatures of Members Present:

SNo	Name of Member	Internal/Expert	Designation	Signature
1	Prof. (Dr.) Sonika Kandari	Internal Member	Professor & Chairman	
2	Prof (Dr.) MMS Rauthan	External Expert (Academic)	Professor, H.N.B Grahwal University	
3	Prof (Dr.) Ashish Negi	External Expert (Academic)	Professor, GB Pant Engineering College	
4	Mrs. Shalu Pundir	Externa Expert (Industry)	TCS Senior Software Developer	
5	Prof. (Dr.) Harsh Kumar	Internal Member	Professor	
6	Dr. G.D. Makkar	Internal Member	Associate Professor	
7	Mr. Harish Sharma	Internal Member	Associate Professor	
8	Ms. Minit Arora	Internal Member	Associate Professor	
9	Dr. Shalini Rawat	Internal Member	Assistant Professor	
10	Dr. Aakanksha Devrari	Internal Member	Assistant Professor	
11	Mr. Abhishek Singh	Alumni	Software Engineer, EFT Corporation	
12	Ms Supriya Raturi	Internal Member	PhD Research Scholar	
13	Mr Aman Singh Rawat	Internal Member	PhD Research Scholar	
14	Ms Kashish Garg	Internal Member	BTech III Semester, student representative	
15	Suresh Pokhrail	Internal Member	MCA III Semester student representative	
16	Ms Vaishali Singhal	Internal Member	MCA I Semester, Student Representative	
17	Mr. Vaibhav Sharma	Internal Member	Head, Department of Information Technology, Member Secretary, BoS	

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SYLLABUS
FOR

Certificate in Information Technology – 1 Year

Diploma in Information Technology – 2 Years

Bachelor of Science in Information Technology – 3 Years

Bachelor of Science in Information Technology (Honors/Honors with Research) – 4 Years

As per NEP 2020

School of Engineering & Technology

(w.e.f. 2025-2026)

Ordinance of Bachelor of Science in Information Technology

Bachelor of Science in Information Technology is an undergraduate degree programmes of either 3 or 4-year duration, with multiple entry and exit points and re-entry options, with appropriate certifications such as:

S. No.	Name of Program	Duration of the program	Remarks
1	**Certificate in Information Technology** after completing 1 year (2 semesters) of study	1 Year	Students who opt to exit after completion of the first year and have secured **44 credits** will be awarded a UG certificate if, in addition, they complete one vocational course/Internship of **4 credits** during the summer vacation of the first year. These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years
2	**Diploma in Information Technology** after 2 years (4 semesters) of study	2 Years	Students who opt to exit after completion of the second year and have secured **88 credits** will be awarded the UG diploma if, in addition, they complete one vocational course/Internship of **4 credits** during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.
3	**Bachelor of Science in Information Technology** after 3-year (6 semesters) programme of study	3 Years	Students who wish to undergo a 3-year UG programme will be awarded UG Degree, **Bachelor of Science in Information Technology** in the Major discipline after successful completion of three years, securing **122 credits**.
4	**Bachelor of Science in Information Technology (Honours / Honours with Research)** after 4 years (8 semester) programme of study	4 Years	A four-year UG honors degree **(Bachelor of Science in Information Technology (Honors) / (Honours with Research)** in the major discipline will be awarded to those who complete a four-year degree programme with **162 credits**.

Eligibility for admission:

Intermediate (10+2) or equivalent in any discipline from any recognized board with minimum 45%

Duration of the Programme: 3/4 years

Examination Scheme:

	Internal Assessment		External Assessment (ESE)
Components	**Internal Exam**	**Assignment & Teacher Assessment**	
Weightage (%)	**15**	**15**	**70**

Programme outcome (POs)

Students will be able to

PO1	Computational knowledge	Acquire knowledge of Computing (algorithm and Coding) &Computing Specialization and Domain Knowledge of proper computing models for defined problems.
PO2	Problem analysis	Identify, formulate and analyze complex computational problems using mathematics, computer science concepts and relevant domains.
PO3	Design/development of solutions	Ability to design efficient solution for complex, real-life problem, system software or Application Software as per needs and specifications of customers.
PO4	Conduct investigations of complex computing problems	Use research-based knowledge and research methods including design of experiments, analysis & interpretation of data & synthesis of information to reach valid conclusions.
PO5	Modern Tool Usage	Ability to demonstrate skills to use modern technologies and tools to analyze and solve the software development problems.
PO6	Professional Ethics	Ability to perform professional practices in an ethical way, keeping in the mind cyber regulations, laws, Intellectual Property Right and norms of professional computing practices.
PO7	Life-Long Learning	Ability to develop confidence and ability for self-education and life-long learning in the broadest context of technological change. Ability to adapt or change the acquired knowledge with change in the technology.
PO8	Project management and finance	Ability to demonstrate knowledge & understanding the Software engineering management principles and apply them as a member & as a leader in a team to manage multidisciplinary projects. Ability to make budget, make estimates of time, effort ,time and analyze risk and reschedule the projects accordingly.

PO9	Communication Efficacy	Ability to effectively communicate with the technical community and with the society about complex computing activities in both verbal and written form, design documents, letters, make effective presentations.
PO10	Societal and Environmental Concern	Ability to understand the impact of IT solutions in a global and societal context. Ability to apply all concepts of green computing to preserve environment and use IT resources in an effective and optimized way.
PO11	Individual and Team Work	Ability to work multi-disciplinary team both as a member and leader, as per need. To develop the leadership and managerial skills in the student.
PO12	Innovations and entrepreneurship	Ability to apply innovation and promote innovative ideas to a suitable opportunity to create value and wealth for the betterment of the individual and society at large.

STUDY & EVALUATION SCHEME
CHOICE BASED CREDIT SYSTEM
(CBCS)
Certificate in Information Technology

FIRST SEMESTER:

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Internal	External	
Theory										
1	Discipline Specific Core	BITDSC101	Fundamental of Computer & Information Technology	3	-	-	3	30	70	100
2	Discipline Specific Core	BITDSC102	Basic Mathematics	3	-	-	3	30	70	100
3	Discipline Specific Core	BITDSC103	Programming in 'C'	3	1	-	4	30	70	100
4	Generic Elective	BITGE101	e- Commerce	3	1	-	4	30	70	100
5	Skill Enhancement Course	BITSC101	Programming Paradigm and Internet Technologies	2	-	-	2	30	70	100
6	Ability Enhancement Course	AEC1	Environmental studies -1	2	-	-	2	30	70	100
7.	Value Addition Course	CITVC101	Computers and Ethics	2	-	-	2	30	70	100
Practical										
8	Discipline Specific Core	BITP11	Lab- Fundamental of Computers	-	-	2	1	30	70	100
9	Discipline Specific Core	BITP12	Lab- Programming in C	-	-	2	1	30	70	100
Total				18	2	4	22	270	630	900

STUDY & EVALUATION SCHEME
CHOICE BASED CREDIT SYSTEM
(CBCS)
Under Graduate Certificate in Information Technology

SECOND SEMESTER:

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Internal	External	
Theory										
1	Discipline Specific Core	BITDSC201	Operating System	3	-	-	3	30	70	100
2	Discipline Specific Core	BITDSC202	Data Structure using C	3	-	-	3	30	70	100
3	Discipline Specific Core	BITDSC203	Digital Electronics	3	1	-	4	30	70	100
4	Generic Elective	BITGE201	Cyber Security and law	3	1		4	30	70	100
5	Skill Enhancement Course	BITSC201	Indian Knowledge System	2	-	-	2	30	70	100
6	Ability Enhancement Course	AEC2	Communication Skill: listening and speaking skills	2	-	-	2	30	70	100
7.	Value Addition Course	CITVC201	The Art of Clean Code	2	-	-	2	30	70	100
Practical										
8	Discipline Specific Core	BITP21	Lab-UNIX	-	-	2	1	30	70	100
9	Discipline Specific Core	BITP22	Lab-Data Structure	-	-	2	1	30	70	100
Total				18	2	4	22	270	630	900
Exit option with Certificate in Information Technology (with the completion of courses) equivalent to a minimum of 44 credits + 4 credits through summer internship /Apprentice				Total Credits (Ist & IInd Semester)			44	Total Marks (Ist & IInd Semester)		1800

STUDY & EVALUATION SCHEME

CHOICE BASED CREDIT SYSTEM (CBCS)

Diploma in Information Technology

THIRD SEMESTER:

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Internal	External	
Theory										
1	Discipline Specific Core	BITDSC301	DBMS	3	-	-	3	30	70	100
2	Discipline Specific Core	BITDSC302	Web Technologies	3	-	-	3	30	70	100
3	Discipline Specific Core	BITDSC303	Computer Network	3	1	-	4	30	70	100
4	Generic Elective	BITGE301	Artificial Intelligence	3	1	-	4	30	70	100
5	Skill Enhancement Course	BITSC301	Digital Marketing	2	-	-	2	30	70	100
6	Ability Enhancement Course	AEC3	Environmental studies-II	2	-	-	2	30	70	100
7	Value Addition Course	CITVC301	Introduction to Data Science	2	-	-	2	30	70	100
Practical										
8	Discipline Specific Core	BITP31	Lab- DBMS	-	-	2	1	30	70	100
9	Discipline Specific Core	BITP32	Lab- Web Technologies	-	-	2	1	30	70	100
			Total	18	2	4	22	270	630	900

STUDY & EVALUATION SCHEME
CHOICE BASED CREDIT SYSTEM
(CBCS)
Diploma in Information Technology

FOURTH SEMESTER:

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Discipline Specific Core	BITDSC401	JAVA Programming	3	-	-	3	30	70	100
2	Discipline Specific Core	BITDSC402	Python Programming	3	-	-	3	30	70	100
3	Discipline Specific Core	BITDSC403	Design and Analysis of Algorithms	3	1	-	4	30	70	100
4	Generic Elective	BITGE401	Software Engineering	3	1	-	4	30	70	100
5	Skill Enhancement Course	BITSC401	Introduction to IoT	2	-	-	2	30	70	100
6	Ability Enhancement Course	AEC4	Communication Skill: Reading and Writing Skill	2	-	-	2	30	70	100
7	Value Addition Course	CITVC401	Big Data Analytics	2	-	-	2	30	70	100
Practical										
8	Discipline Specific Core	BITP41	Lab- JAVA Programming	-	-	2	1	30	70	100
9	Discipline Specific Core	BITP42	Lab- Python Programming	-	-	2	1	30	70	100
			Total	**18**	**2**	**4**	**22**	**270**	**630**	**900**
Exit option with **Diploma in Information Technology** (with the completion of courses) equivalent to a minimum of **8credits+ 4 credits through summer internship /Apprentice**				**Total Credits (I^st to IV^th Semester)**			**88**	**Total Marks (I^st to IV^th Semester)**		**3600**

STUDY & EVALUATION SCHEME

CHOICE BASED CREDIT SYSTEM
(CBCS)
B.Sc. (Information Technology) –Honors

FIFTH SEMESTER:

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Internal	External	
Theory										
1	Discipline Specific Core	BITDSC501	C# .NET	3	-	-	3	30	70	100
2	Discipline Specific Core	BITDSC502	Introduction to Machine Learning	3	-	-	3	30	70	100
3	Discipline Specific Core	BITDSC503	Statistics	3	1	-	4	30	70	100
4	Generic Elective	BITGE504	Enterprise Resource planning	3	1	-	4	30	70	100
5	Discipline Specific Elective	BITDSE505A	Android Programming/MOOC	3	1	-	4	30	70	100
		BITDSE505B	Cloud Computing/MOOC							
		BITDSE505C	Computer Graphics/MOOC							
Practical										
6	Discipline Specific Core	BITP51	Lab-C# .NET	-	-	4	2	30	70	100
7	Seminar	BITSM5	Seminar	-	-	4	2	30	70	100
			Total	**15**	**3**	**8**	**22**	**210**	**490**	**700**

STUDY & EVALUATION SCHEME
CHOICE BASED CREDIT SYSTEM
(CBCS)
B.Sc. (Information Technology)

SIXTH SEMESTER:

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Internal	External	
Practical										
1	Project	BITP61	Capstone project	-	-	24	12	100	400	500
			Total			**24**	**12**	**100**	**400**	**500**
Exit option with **Bachelor Degree in Information Technology**(with the completion of courses) equivalent to a minimum of **122 credits**				**Total Credits (Istto VIth Semester)**			**122**	**Total Marks Istto VIth Semester))**		**4800**

Capstone Project: Capstone project is a semester long multifaceted experimental/research assignment that serves as a culminating academic and intellectual experience for students, taken in the last semester of study. It is of 12 credits and may be done groups of not more than three students, and in three modes as follows:

- **Mode 1:** Project with a department faculty.

- **Mode 2:** Project as part of Industry Internship arranged only by the career and placement service of the University. Students securing this assignment on their own will not be allowed, unless the project is secured at a well-known industry, and duly approved by the department. The department's decision in all such cases will be final.

- **Mode 3:** Semester long project in an academic institute/lab of National/International Importance, secured by students on their own. The department's decision to allow in all such cases will be final.

STUDY & EVALUATION SCHEME
CHOICE BASED CREDIT SYSTEM
(CBCS)
B.Sc. (IT) Honors / (Honors with Research)

SEVENTH SEMESTER:

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Discipline Specific Core	BITDSC701	Data Science using python	3	-	-	3	30	70	100
2	Discipline Specific Elective	BITDSE702A	Research methodology	3	1	-	4	30	70	100
		BITDSE702B	Software Project management							
3	Discipline Specific Elective	BITDSE703A	Network Security and Cryptography/MOOC	3	1	-	4	30	70	100
		BITDSE703B	Data Analysis with R /MOOC							
4	Discipline Specific Elective	BITDSE704A	Optimization Technique in Machine Learning /MOOC	3	1	-	4	30	70	100
		BITDSE704B	Advance RDBMS/MOOC							
Practical										
5	Discipline Specific Core	BITP71	Lab- Data science using python	-	-	2	1	30	70	100
6	Project	BITPR705A BITPR705B	Dissertation on Research* /Academic Project	-	-	12	6	30	70	100
Total				12	3	14	22	180	420	600

*** BITPR705A (Dissertation on Research) -A research paper Publication/Presentation in Conference/Seminar is compulsory for successful completion of semester.**

STUDY & EVALUATION SCHEME
CHOICE BASED CREDIT SYSTEM
(CBCS)

B.Sc. (IT) Honors

EIGHTH SEMESTER:

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Discipline Specific Core	BITDSC801	Machine Learning using Python	3		-	3	30	70	100
2	Discipline Specific Elective	BITDSE802A	Research Publication Ethics	3	1	–	4	30	70	100
		BITDSE802B	Data and Visual Analytics in AI							
3	Discipline Specific Elective	BITDSE803A	Generative AI	3	1	-	4	30	70	100
		BITDSE803B	Deep Learning							
		BITDSE803C	Introduction to Blockchain							
PRACTICAL										
5	Discipline Specific Core	BITP81	Advanced Machine Learning Lab	-	-	2	1	30	70	100
6	Project	BITPR805A BITPR805B	Dissertation on Research*/Academic Project	-	-	12	6	30	70	100
Total				**9**	**2**	**14**	**18**	**150**	**350**	**500**
UG Degree (Honors/Honors with research) in Information Technology (with the completion of courses) equivalent to a minimum of **162credits**				**Total Credits (Ist to VIIIth Semester)**			**162**	**Total Marks (Ist to VIIIth Semester)**		**5900**

*** BITPR805A (Dissertation on Research) -A research paper Publication/Presentation in Conference/Seminar is compulsory for successful completion of semester.**

B.Sc. (IT) (Honors with Research)

EIGHTH SEMESTER:

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Internal	External	
Practical										
1	Research Project	BITRP82	Dissertation (For Research Track)*	-	-	-	18	150	350	500
			Total				**18**	**150**	**350**	**500**
Exit option with **Bachelor Degree in Information Technology**(with the completion of courses) equivalent to a minimum of **162 credits**				**Total Credits (I^st^to VIII^th^ Semester)**			**162**	**Total Marks I^st^to VIII^th^ Semester))**		**5900**

***A research paper publication in journal /Conference/Seminar is compulsory for successful completion of semester.**

FIRST SEMESTER:

Course code	**: BITDSC101**				
Course Name	**: Fundamental of Computer & Information Technology**				
Semester /Year	**: 1st /1st**				
		L	**T**	**P**	**C**
		3	**-**	**-**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

COURSEOBJECTIVES:

- The main objective is to introduce Programming in a simple language to all undergraduate students, regardless of their specialization.
- It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry.
- The focus of the subject is on introducing skills relating to computer basics, computer applications, programming, interactive Medias, Internet basics etc.

COUSECONTENTS:

UNIT1 Introduction to Computers **[No. of Hours: 8]**
Introduction, Generation of Computer **Input Devices-**Keyboard, Mouse, Scanner, OCR, OMR, MICR. **Output Devices-** Printer, Types of Printer, Plotter, **Monitor:** CRT; Central Processing Unit, CPU Arithmetic Logic Unit, Control Unit, Instruction Set, Registers, Processor and Type of Processors.

UNIT2– Memory & Number System **[No. of Hours: 8]**
Main Memory Organization, RAM, ROM, EPROM, PROM, Cache Memory, Memory Devices, Number Systems: Binary, Decimal, Octal, Hexadecimal, Binary Arithmetic, Character Codes (BCD), Excess-3, Gray Code, ASCII.

UNIT3–System Software and Application Software **[No. of Hours: 8]**
System software- utility packages, compilers, interpreters, Operating Systems, Elementary Commands of DOS, Booting.
Application software's – Word-processing, spreadsheet, Virus-working, features, types of viruses, virus detection prevention and cure, Data Base Management System.

UNIT-4: MS Office **[No. of Hours: 8]**
Introduction to open office/MS office, Word Processing: Formatting Text, Pages, Lists, Tables. Spreadsheets: Worksheets, formatting data, creating charts and graphs, using formulas and functions, macros, Pivot Table). Presentation Tools: Adding and formatting text, pictures, graphic objects, including charts, objects, formatting slides, notes, hand-outs, slide shows, using transitions, animations.

UNIT 5 – Computer Network & Communication Technologies **[No. of Hours: 8]**
Communication system elements, communication modes (simplex, half duplex and full duplex analog and digital, synchronous and Asynchronous, Communication media: wired and wireless, LAN WAN, MAN, network topologies.

TEXTBOOKS:

TB1. Raja Raman V: Fundamentals of Computers

REFERENCE BOOKS:

RB1. Sanders D.H: Computers Today

COURSE OUTCOMES:

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	To understand the fundamentals of Computers, Block Diagram of Computer, Computer hardware.
CO2	Understand Memory Architecture, to perform conversion from one number system to another number system.
CO3	Will be able to analyze software, to identify type of software, to know the concept of Operating System and Functions of Operating System, to memorize the various commands of different Operating System
CO4	Illustrate an operating system by analyzing its working learn basic word processing, spreadsheet and presentation graphics and learn about various viruses and prevention from them.
CO5	Students will be able to know concept of networking, Networking based reference model, Internet and different term related to internet. Different types of protocols associated with internet
CO6	To create and design algorithm suitable flowchart of different problems

CO-POMAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	1	1	1	1	2	1
CO2	1	3	2	2	1	1	1	1	1	1	1	1
CO3	2	2	1	1	1	1	1	1	2	1	2	1
CO4	2	2	3	1	1	3	1	1	1	2	1	1
CO5	2	3	2	2	1	1	1	2	1	1	2	2
CO6	2	2	2	1	1	1	1	2	1	2	1	2
AVG	2	2.16	1.8	1.33	1	1.33	1	1.33	1.16	1.33	1.5	1.33

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSC102**				
Course Name	**: Basic Mathematics**				
Semester /Year	**: 1st /1st**				
	L	**T**	**P**	**C**	
	3	**-**	**-**	**4**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSEOBJECTIVES:

- To study the concept of functions.
- To apply various methods to solve the problems.
- To find the concept of function from relation.
- To study probability and solve various real life problems
- To study the matrices and its types.

COURSECONTENTS:

UNIT I. Proposition Logic **[No. of Hours: 8]**

Proposition, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), validity of an argument, contrapositive, Universal and existential quantifiers.

UNIT II. Matrix **[No. of Hours: 8]**

Definition & types of matrix, Matrix addition and multiplication, Transpose and inverse of matrix.

UNIT III. Relations and functions **[No. of Hours: 8]**

Cartesian product of sets, relation, types of relation, equivalence relation, representation of a relation, closure of a relation, partial order relation, Hasse diagram. Binary operations, groups and properties, subgroups, cyclic groups and properties, cosets, Lagrange's theorem.

UNIT -IV Posets **[No. of Hours: 8]**

Posets, well ordered set, maximal and minimal element, greatest and least element, least upper bound, greatest lower bound.

UNIT –V Lattices **[No. of Hours: 8]**

Lattices, properties of Lattices, Isomorphism, Some special lattices: Bounded lattice and complemented lattices, distributive lattice Modular lattice, complete lattice.

TEXT BOOKS:

TB1. Text Book of Engineering Mathematics, Mr. N.P.Bali.

REFERENCEBOOKS:

RB1. Higher Engineering Mathematics, B.S.Grewal

COURSEOUTCOMES:

CO#	Detailed Statement of the CO
CO1	Illustrate the basic concepts of Proposition Logic
CO2	Understand the various concepts of relations and functions
CO3	Teach to use mathematical induction to solve various linear and non-linear problems.
CO4	Analyze Posset and Hasse diagrams and solve various types of logic by using prepositional logic.
CO5	Evaluate basic concepts of posets and Lattices and explore them
CO6	Design and explain the basic operations of matrices and to solve the problems of matrices.

CO–POMAPPING:

CO	POI	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	2	3	1	1	1	1				2	
CO2	3	1	3	2	2	1	3	1				
CO3	3	2	1	1		2	1		2		2	
CO4	2	1	2	2	1	2	3	1		2	1	
CO5	3	3	3	1	2	1	3	2			2	2
CO6	3	2	1	2	3	1	3	2	1	2	1	2
AVG	2.8	1.83	2.16	1.5	1.5	1.33	2.33	1	0.5	0.66	1.33	0.66

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**:BITDSC103**				
Course Name	**:Programming in 'C'**				
Semester /Year	**:1st /1st**				
		L	**T**	**P**	**C**
		3	**1**	**-**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSEOBJECTIVES:

- Understand the basics of Programming.
- Understand functional hierarchical code generation.
- Understand the usage of characters, string, integers and special symbols in programming.
- Understand loops and decision-making statements in order to solve problems.
- Understand arrays and implementation of various operations on arrays.
- Understand the use of functions and pointer in programming.
- Understand the use of structure & union.
- Understand file operations and implement file operation in C programming for a set of problems.

COURSECONTENTS:

Unit1 **[No. of Hours: 05]**

History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs.

Unit2 **[No. of Hours:09]**

Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Operators: Unary operators, Arithmetic & logical operators, Bitwise operators, Assignment operators and expressions, Conditional expressions, precedence and order of evaluation.

Unit3 **[No. of Hours: 08]**

Control Statements: if-else, switch, break, continue, the comma operator, go to statement. Loops: for, while, do-while. **Arrays:** Linear arrays, multidimensional arrays, Arrays and strings.

Unit4: **[No. of Hours: 08]**

Functions: built-in and user-defined, function declaration, definition and function call, parameter passing: call by value, call by reference, recursive functions, passing arrays to functions,Pointer , address of (&) operator, pointer to pointer, Macros, C Preprocessor.

Unit5: **[No. of Hours: 10]**

Structure and Union: Definition and differences, self-referential structure, Dynamic Memory Allocation, calloc and malloc functions, Storage classes (automatic, external, register and static), Introduction to File handling

TEXTBOOKS:

TB1: Yashwant Kanetkar, Let us C,17th Edition, BPB Publications,2020.
TB2: Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.

REFERENCEBOOKS:

RB1. Gottfried, "Programming in C, Schaum's Series Tata McGraw

COURSEOUTCOMES:

CO#	Detailed Statement of the CO
CO1	Identify the need and use of programming in real world environment
CO2	Explain data types, variables and arithmetic operations in programming.
CO3	Apply the concept of functions and pointer. Resolve Real world problems using Functions and pointers.
CO4	Analyze array and String concepts and implement array and string using functions and pointers.
CO5	Appraise user defined data types including structure and union.
CO6	Create programs for all programming problems

COPOMAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	1	1	1	1			
CO2	2	2	2	3	1	1	1	1	1	1	1	1
CO3	2	3	2	3	1	1	1	2	1			1
CO4	2	2	2	3	1	1	1	1	1	1	1	
CO5	1	2	2	3	1	1	1	1	1	1		1
CO6	2	3	3	3	1	1	1	1	1		2	
AVG	2	2.33	2	2.66	1	1	1	1.16	1	0.5	0.66	0.5

3: Highest Correlated, 2: Medium Correlated, 1:Lowest Correlated

Course code	**: BITGE101**			
Course Name	**: e-Commerce**			
Semester /Year	**: 1st / 1st**			
L	**T**	**P**	**C**	
3	**1**	**0**	**4**	

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

1. To learn the concepts and skills for the strategic use of e-commerce.
2. To learn E-commerce Models, business to consumers, business-to-business, and Consumer to consumer.
3. To be able to examine Electronic Payment systems, and Mobile commerce
4. To understand Security on Internet
5. Overall improve the business profits and thereby improve the profit of the organization.

COURSE CONTENTS:

Unit-I **[No. of Hours: 8]**

Basic of e-commerce- Introduction: Electronic Commerce, Definition of E-Commerce, Advantages and Disadvantages of .E-commerce models, Architectural framework of e-commerce Applications of E- commerce

Unit-II **[No. of Hours: 8]**

Electronic Payments: Overview, The SET protocol, Payment Gateway, certificates, Digital tokens, Smart card credit card, magnetic strip card, E-checks, Credit/Debit Card based EPS, Online Banking

Unit-III **[No. of Hours: 8]**

Mobile Commerce: Introduction, Wireless Application Protocol (WAP), Mobile Computing devices and applications

Unit-IV **[No. of Hours: 8]**

Web security and Encryption: Security issues on the Web, Importance of Firewall, Limitation of Firewall, Encryption Techniques, Symmetric and Asymmetric Encryption, Digital Signature, Virtual Private Network.

Unit-V **[No. of Hours: 8]**

EDI: Introduction to EDI, Definition of EDI, Difference between EDI and Email, Security and Agreements

TEXT BOOKS:

TB1: Ravi Kalakota, Andre Winston, "Frontiers of E-commerce", Addison Wesley
TB 2: Bajaj and Nag, "E-commerce: The cutting edge of business", TMH

REFERENCE BOOKS

RB1: 3. P. Loshin, John Vacca, "Electronic Commerce", Firewall Media, New Delhi

COURSE OUTCOMES (COS):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Defining the basic concepts e-commerce.
CO2	Understanding the Architectural framework of E-commerce.
CO3	Apply various concepts viz. EDI, Electronic Payments systems .
CO4	Analyze the security aspects of E-commerce
CO5	Evaluate the smart e-commerce processes and M-commerce.
CO6	Discuss the mobile commerce and E –commerce platforms

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3		3	3		2		2		2	2			2
CO2	2	2	3		2	3		2		2		2	2	1	1	2
CO3	3	3	1								3	1	2	1	3	2
CO4	2	1	3		3	3	2	2		2		2	2		1	2
CO5	2	1	3		3	3	1	2	1	2		2	2	2	2	2
CO6	2	2	2		2	2	1	1	1	1		2	2	2	2	2
AVG	2.33	1.66	2.5		2.16	2.3	0.66	1.5	0.33	1.5	0.5	1.83	2	1	1.5	2

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**:BITSC101**				
Course Name	**: Programming Paradigm and Internet Technologies**				
Semester /Year	**: 1st /1st**				
	L	**T**	**P**	**C**	
	2	**-**	**-**	**2**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

1. Understand the basics of Programming Paradigms,
2. To learn the different categories of Programming languages
3. To be able to understand fundamentals of Computer network..
4. To learn various fundamental concepts on Internet and its prevailing technologies.

COURSE CONTENTS

UNIT-1 **[No. of Hours: 7]**

Basics of Programming

Program, Algorithm, Flowchart, software, System Software, Application Software ,Program bugs , debugging , Programming error: syntax error , logical error ,runtime error ,exception handling

UNIT-2 **[No. of Hours: 7]**

Basics of Programming Language

Category of language: High level language, Middle level language, Low level language.
Types of Language: Procedural programming, structured programming, object oriented programming, Event Driven programming, Web based programming, App based programming language, embedded programming etc.
Language translators: Compiler, Assembler, Interpreter.

UNIT-3 **[No. of Hours: 7]**

Basics of Computer Network

Component of computer network, Mode of Communication, Data communication and Voice communication, digital and analog signal types of Network : LAN ,WAN, MAN, LAN topology, Guided and Non Guided Media, IP address , MAC address ,Protocols of Computer Network: ARP , RARP, BOOTP, IP ,TCP ,UDP, HTTP, HTTPS, FTP, TFTP ,POP ,SMTP ,DNS.

UNIT-4 **[No. of Hours: 7]**

Internet Technology

Webpage ,static and dynamic webpage ,website , we server, hypertext ,hyper link , HTML, Scripting languages, URL, Downloading , uploading, search engine ,Browser, ISP ,Web hosting ,Domain and its registration , Email, MODEM, Broadband ,bandwidth.

TEXT BOOKS:

TB1. Programming Languages: Principles and Paradigms Maurizio Gabbrielli , Simone Martini .
TB2. Programming Language Pragmatics by Michael Scott

REFERENCE BOOKS:

RB1. Types and Programming Languages , by Benjamin_The MIT Press.

COURSE OUTCOMES (CO):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	To understand the concepts of program, flow chart, algorithm, error in program .
CO2	Will be able to analyze Types of programming languages and language translators.
CO3	Students will be able to know concepts of computer network, types and internet technologies and protocols used.
CO4	Will be able to get idea about what is program and program paradigms, to develop strategies behind designing a program, to know the structure i.e. Top-Down and Bottom-Up approach of Modular Programming.
CO5	Will be able to learn about different generations of Programming language, to know different methodologies to solve computation task.
CO6	To create and design algorithm suitable flowchart of different problems

CO-PO MAPPING:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	1	1	1		1		1	1
CO2	2	2	1	1	1	1	1			1		
CO3	1	2	2	2	1	1	1	1	1	1		1
CO4	1	2	2	2	1	1	1			1	1	
CO5	2	1	1		1	1	1	2	1			1
CO6	1		1	1	1		1	1			1	
AVG	1.5	1.33	1.5	1.33	1	0.83	1	0.66	0.5	0.5	0.5	0.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	: **AEC1**				
Course Name	: **Environmental Studies – I**				
Semester /Year	**: 1st Sem / 1st Year**				
		L	**T**	**P**	**C**
		2	**0**	**0**	**2**

Unit I. Humans and the EnvironmentCourse Learning Outcomes

After completing this unit, students will be able to:

- Appreciate the historical context of human interactions with the environment.
- Gain insights into the international efforts to safeguard the Earth's environment and resources.

Unit1.Outline

- Human population growth: Impacts on environment, human health and welfare
- Dams: Resettlement and rehabilitation of project-affected persons (case studies)
- Disaster management: Floods, earthquake, cyclones and landslides
- Environmental movements: *Chipko*, Silent valley, *Bishnois* of Rajasthan
- Environmental ethics: Role of Indian and other religions and cultures in environmentalconservation
- Environmental communication and public awareness, case studies (e.g., CNG vehicles inDelhi).

Suggested readings

1. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to theTwenty-First Century, Cambridge University Press.

2. Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, OxfordUniversity Press.

3. Hughes, J. Donald (2009) An Environmental History of the World- Humankind's Changing Rolein the Community of Life, 2nd Edition. Routledge.

4. Perman, R., Ma, Y., McGilvray, J., and Common, M. (2003) Natural Resource and EnvironmentalEconomics. Pearson Education.

5. Simmons, I. G. (2008). Global Environmental History: 10,000 BC to AD 2000. EdinburghUniversity Press

Unit II. Natural Resources and Sustainable DevelopmentCourse Learning Outcomes

After completion of this unit, students would be able to:

- Understand the concept of natural resources; identify types of natural resources, their distributionand use with special reference to India.
- Discuss the factors affecting the availability of natural resources, their conservation andmanagement.
- Explain sustainable development, its goals, targets, challenges and global strategies for

sustainabledevelopment.

Unit II Outline

- Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable.
- Forest resources: Types, threats and conservation strategies.
- Water resources: Types of water resources- fresh water and marine resources; Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges;Water scarcity and stress; Conflicts over water.
- Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation.
- Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy
- Introduction to sustainable development: Sustainable Development Goals (SDGs)-targets and indicators, challenges and strategies for SDGs.

Suggested readings

1. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson.

2. John W. Twidell and Anthony D. (2015). Renewable Energy Sources, 3rd Edition, Weir Publisher(ELBS).

3. William P. Cunningham and Mary A. (2015) Cunningham Environmental Science: A GlobalConcern, Publisher (Mc-Graw Hill, USA).

4. Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science,Ela Publisher (Pearson).

5. Singh, J.S., Singh, S.P. & Gupta, S.R. 2006. Ecology, Environment and ResourceConservation. Anamaya Publications https://sdgs.un.org/goals.

Unit III. Environmental Issues: Local, Regional and GlobalCourse Learning Outcomes

After completion of this unit, students would be able to:

- Develop a critical understanding of the environmental issues of concern
- Understand the concepts of spatial and temporal scales and their importance
- Understand the sectoral effects on the local, regional, and global environmental issues

Unit III Outline

- Pollution: Types of Pollution- air, noise, water, soil, thermal, radioactive; municipal solid waste, hazardous waste; transboundary air pollution; acid rain; smog.
- Land use and Land cover change: land degradation, deforestation, desertification, urbanization.
- Global change: Ozone layer depletion; Climate change. Disasters – Natural and

Man-made(Anthropogenic).

Suggested Readings

1. Harper, Charles L. (2017) Environment and Society, Human Perspectives on Environmental Issues6th Edition. Routledge.

2. Harris, Frances (2012) Global Environmental Issues, 2nd Edition. Wiley- Blackwell.

3. William P. Cunningham and Mary A. (2015). Cunningham Environmental Science: A globalconcern, Publisher (Mc-Graw Hill, USA)

4. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. https://doi.org/10.1201/9781003096238

5. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford UniversityPress.

Unit IV. Conservation of Biodiversity and EcosystemsCourse Learning Outcomes

After completion of this unit, students would be able to:

- Understand the concepts of ecosystems, biodiversity and conservation.
- Describe the main types of ecosystems and their distribution.
- Discuss the factors impacting biodiversity loss and ecosystem degradation.
- Explain major conservation strategies taken in India.

Unit V. Case Studies & Fieldwork

Unit Outline

- Biodiversity and its distribution: Biodiversity as a natural resource; Levels and types of biodiversity; Biodiversity hotspots; Species and ecosystem threat categories.
- Ecosystems and ecosystem services: Major ecosystem types in India and their basic characteristics-forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance.
- Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change.
- Major conservation policies: in-situ and ex-situ conservation approaches; Major protected areas; National and International Instruments for biodiversity conservation; the role of traditional knowledge.

Suggested Readings

1. Bawa, K.S., Oomen, M.A. and Primack, R. (2011) Conservation Biology: A Primer for SouthAsia. Universities Press.

2. Sinha, N. (2020) Wild and Wilful. Harper Collins, India.

3. Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022)Conservation through Sustainable Use: Lessons from India. Routledge.

4. Bhagwat, Shonil (Editor) (2018) Conservation and Development in India:

ReimaginingWilderness, Earthscan Conservation and Development, Routledge.

5. Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK

Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall and list the major environmental challenges faced by humanity, including population growth, resource depletion, pollution types, and the impact of human-made structures such as dams.
CO2	Comprehend the concepts of sustainable development, the classification of natural resources, and the significance of biodiversity and ecosystem services.
CO3	Demonstrate the ability to document biodiversity in various ecosystems, participate in environmental conservation activities like plantation drives, and use knowledge of environmental issues in real-world contexts.
CO4	Examine and interpret the causes and effects of major environmental problems, including land degradation, deforestation, and climate change, and analyze the Environmental impact of over-exploitation of resources.
CO5	Assess the effectiveness of various conservation policies, both national and international, in preserving biodiversity and ecosystems, and critique the role of different environmental movements in India.
CO6	Design and construct detailed reports on specific environmental case studies, such as the Tehri Dam's impact, and produce maps highlighting the protected areas of India.

CO –PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	1	1	1	1	1	2	2	1
CO2	3	2	2	3	1	2	1	1	1	3	2	1
CO3	2	3	3	2	2	2	2	2	1	3	3	1
CO4	2	3	3	3	2	2	2	2	2	3	3	1
CO5	1	2	2	3	3	2	2	2	1	2	2	1
CO6	2	3	3	2	2	2	3	2	2	3	3	1
AVG	**2**	**2.5**	**2.5**	**2.67**	**1.83**	**1.83**	**1.83**	**1.67**	**1.33**	**2.67**	**2.5**	**1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : CITVC101				
Course Name : **COMPUTERS AND ETHICS**				
Semester /Year : **1st / 1st**				
	L	**T**	**P**	**C**
	2	**0**	**0**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

- Understand ethical considerations in computing and information technology.
- Explore the ethical dimensions of privacy, cybersecurity, and social media.
- Analyze the ethical implications of emerging technologies and artificial intelligence.
- Apply ethical decision-making models to resolve ethical dilemmas in computing.
- Evaluate the social and cultural impacts of technology on society.
- Develop ethical guidelines for responsible technology use and development.

COURSE CONTENTS:

Unit 1: Introduction to Computers and Ethics **[No. of Hours: 5]**

Introduction to ethical theories and frameworks, Ethical decision-making models and approaches, Ethical considerations in computing and information technology, Historical perspectives on computers and ethics

Unit 2: Privacy and Data Protection **[No. of Hours: 6]**

Concepts of privacy and data protection, Ethical issues related to data collection, storage, and sharing, Legal and regulatory frameworks for privacy, Privacy-enhancing technologies and practices, Privacy implications of emerging technologies (e.g., Internet of Things, biometrics)

Unit 3: Cybersecurity and Ethical Hacking **[No. of Hours: 6]**

Fundamentals of cybersecurity and its importance, Ethical considerations in hacking and penetration testing, Ethical hacking techniques and methodologies, Legal and ethical issues related to vulnerability disclosure, Cybersecurity ethics in the context of organizational security practices

Unit 4: Social Media and Online Ethics **[No. of Hours: 6]**

Social media ethics and responsible online behavior, Privacy risks and ethical dilemmas in social media usage, Cyber bullying, harassment, and online hate speech, Implications of social media algorithms and filter bubbles, Social media and its impact on democracy and political discourse

Text Books:

TB1. Computers and Society: Modern Perspectives by by Ronald M. Baecker

TB2. THE HANDBOOK OF INFORMATION AND COMPUTER ETHICS by Kenneth Einar Himma and Herman T. Tavani.

Reference Books/ Online Resources

RB1. "Ethics for the Information Age" by Michael J. Quinn

RB2. "Ethics in Information Technology" by George Reynolds

RB3. "Ethics in Computing: A Concise Module" by Joseph Migga Kizza

RB4. "Information Ethics: Privacy, Property, and Power" by Adam D. Moore

Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall and explain key ethical theories and frameworks relevant to computing and information technology. Identify and describe the legal and regulatory frameworks for privacy and intellectual property in the digital domain.
CO2	Demonstrate an understanding of the ethical considerations in computing, including privacy, cybersecurity, and social media. Explain the social and cultural impacts of technology and the ethical responsibilities of technology professionals.
CO3	Apply ethical decision-making models and approaches to analyze and resolve ethical dilemmas in computing and information technology. Apply privacy-enhancing technologies and practices to protect personal data and mitigate privacy risks.
CO4	Analyze the ethical implications of emerging technologies, on society and individuals.Evaluate the ethical considerations in hacking and penetration testing, considering legal and ethical issues related to vulnerability disclosure.
CO5	Evaluate the ethical implications of social media usage, including privacy risks, cyberbullying, and the impact of algorithms on information access. Critically evaluate the ethical dimensions of artificial intelligence, including algorithmic bias, job displacement, and transparency.
CO6	Construct well-reasoned arguments and proposals for addressing ethical challenges in the use of computers and information technology. Design ethical guidelines and principles for the development and deployment of emerging technologies, considering privacy, transparency, and societal impact.

CO –PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	2	1	1	1	1	2	2	2
CO2	2	3	3	2	3	2	2	2	2	3	3	3
CO3	2	2	2	1	2	2	1	1	1	2	2	2
CO4	1	2	2	2	2	1	1	1	1	2	2	2
CO5	1	2	2	2	2	1	1	1	1	2	2	2
CO6	2	2	2	2	2	2	2	2	2	2	2	2
AVG	1.6	2.4	2.4	1.8	2.4	1.6	1.4	1.4	1.4	2.4	2.4	2.4

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP11**			
Course Name	**: LAB-Fundamental of Computers**			
Semester /Year	**: 1st /1st**			
L	**T**	**P**	**C**	
0	**0**	**2**	**1**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

1. To provide understanding of DTP Skills.
2. To provide insight into various office automation Tools like MS Access , MS word ,MS excel , MS power Point.

COURSE CONTENTS:

1. Introduction to Personal Computer: Hardware, Software
2. Introduction to basic commands of DOS and Linux
3. Installing Windows XP in Personal Computer
4. Creation of Resume in Windows MS Office
5. Creation of MS Excel Table and performing some mathematical function
6. Creation of pie chart, histograms in excel
7. Creating mail merge in MS Word.
8. Creating macro in excel.
9. Creation of MS PowerPoint using different animation and effects in the power point.
10. Introduction to basic commands of Linux

COURSE OUTCOMES (CO):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Describe the basics of computer
CO2	Apply word processing techniques
CO3	Implement word processing using spread sheets
CO4	Analyze the problem-solving techniques
CO5	Apply factoring and array techniques in real time
CO6	To create and design spreadsheets , advertisement ,visiting cards ,invitation letters etc. in MS word and power point presentation

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			1	1	1	1		1	1
CO2	3	3	2	2				1	1	1		1
CO3	3	3	2		1		1	1	1	1	1	
CO4	2	3	3				1	1				1
CO5	3	3	3			2	1	1		1		
CO6	1	1	1	1	2	1	1	1			1	
AVG	2.5	2.66	2.16	0.5	0.5	0.66	0.83	1	0.5	0.5	0.5	0.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP12**			
Course Name	**: LAB - PROGRAMMING IN C**			
Semester /Year	**: 1st /1st**			
L	**T**	**P**	**C**	
0	**0**	**2**	**1**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES: The objectives of this course are

- Understand the basics of Programming.
- Understand functional hierarchical code generation.
- Understand the usage of characters, string, integers and special symbols in programming.
- Understand loops and decision-making statements in order to solve problems.
- Understand arrays and implementation of various operations on arrays.
- Understand the use of functions and pointer in programming.
- Understand the use of structure &union.
- Understand file operations and implement file operation in C programming for a set of problems.

COURSECONTENTS:

1. Programs based on variables
2. Programs based on conditional
3. Programs based on loops
4. Programs based on arrays
5. Programs based on strings
6. Programs based on functions
7. Programs based on pointers
8. Programs based on structure and union
9. Programs based on file handling

TEXTBOOKS:

TB1: Yashwant Kanetkar, Let us C,17th Edition, BPBPublications,2020.
TB2: Reema Thareja, " Programming in C ", Oxford University Press, Second Edition,2016.

REFERENCEBOOKS:

RB1: Gottfried," Programming in C, Schaum's Series Tata McGra

COURSEOUTCOMES:

Upon successful completion of the course as a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify the need and use of programming in real world environment
CO2	Explain data types, variables and arithmetic operations in programming.
CO3	Apply the concept of functions and pointer. In addition, resolve real world problems using functions and pointers.
CO4	Analyze Array and String concepts and implement array and string using functions and pointers.
CO5	Appraise user defined data types including structure and union.
CO6	Create programs for all programming problems.

COPOMAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2				1		1	1	1		1
CO2	2	2	2	3	1	1			1	1		
CO3	2	3	2	3	1	1	1	2	1	1	2	1
CO4	2	2	2	3	1	1	1		1	1	1	
CO5		2	2	3	1	1	1	1	1	2		1
CO6	2	3	3	3	1	1	1	1	1	1		
AVG	1.83	2.33	1.83	2.5	0.83	1	0.66	0.83	1	1.16	0.5	0.5

3: Highest Correlated,2: Medium Correlated,1: Lowest Correlated

SECOND SEMESTER:

Course code : BITDSC201				
Course Name : Operating System				
Semester /Year : 2nd Sem / 1st Year				
	L	**T**	**P**	**C**
	3	**-**	**0**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- To understand various operating system types, Architecture design of OS and their services.
- To study process management concepts and various scheduling algorithm.
- To understand process synchronization concepts and deadlock handling mechanism.
- To learn various memory management schemes.
- To study file management and Disk management techniques

COURSE CONTENTS:

UNIT 1 **[No. of Hours: 8]**

Introduction: Operating System- Definition, Types of OS- Simple batch system, Time sharing systems, Real time systems, Multiprocessor systems, Distributed systems, System components -OS Services, System Calls.

UNIT 2 **[No. of Hours: 8]**

Process concepts: PCB, Process Scheduling, Operations on Processes, Co-operating process IPC , Threads- Overview, Benefits, User & Kernel Threads. CPU Scheduling: Scheduling criteria , Preemptive & Non-preemptive scheduling, Scheduling Algorithms.

UNIT 3 **[No. of Hours: 9]**

Process Synchronization: Background, Critical Section problem, Critical Regions, Synchronization, hardware, Semaphores, Classic Problems of Synchronization, Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

UNIT 4 **[No. of Hours: 07]**

Memory Management: Logical vs. Physical address space, Swapping, Contiguous memory allocation , Non-Contiguous memory allocation- Paging, Segmentation, Segmentation with paging. Virtual Memory: Background, Demand paging - Performance, Page replacement, Page replacement algorithms (FCFS, LRU), Allocation of frames, Thrashing.

UNIT 5 **[No. of Hours: 08]**

File Systems: File concept, access methods, Allocation methods-contiguous, linked and index allocation, Directory System – single level, tree structured, acyclic graph and general graph directory, File protection. Disk Management: Secondary storage structure: Disk structures, Disk Scheduling, Disk reliability.

TEXT BOOKS:

TB1. Milankovic M "Operating System concepts and Design", 2nd edition, Tata Mcgraw Hill.

REFERENCE BOOKS:

RB1. Abraham Silberschatz , Peter Baer Galvin & Greg Gagne , "Operating System Concepts", Sixth Edition, John Wiley & Sons, Inc.

COURSE OUTCOMES:

Upon successful completion of the course as a student will be able to

CO	DESCRIPTION
CO1	To understand & remember different OS types and basic component of OS Architecture.
CO2	Analyze issues in process management and evaluations of various scheduling algorithms.
CO3	Understand process synchronization problem and provide (create) solution for critical section Problem and deadlock management.
CO4	Analyze and understand various memory management techniques.
CO5	Identify or evaluate the use of storage management techniques and solve various disk scheduling problems.
CO6	Identify or evaluate the use File System.

CO-POMAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1		1	1	2					2
CO2	1	3	1	2	1	1	1		1	1		
CO3	2	3	1	2	1	1	1	1		2		2
CO4	2	2	2	1		2	1		1	1	2	1
CO5	2	3	1	2	1	2	1	1	2	1		2
CO6	2		1	1		1	1	1	2	1	2	1
AVG	2	1.5	1.33	1.33	0.66	1.33	1.16	0.5	1	1	0.66	1.33

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSC202**			
Course Name	**: Data Structure Using C**			
Semester /Year	**: 2nd Sem / 1st Year**			
	L	**T**	**P**	**C**
	3	**-**	**0**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES: The objectives of this course are

1. To understand basics knowledge of data structure operations, algorithms and their application.
2. To design and implement algorithms and data structure operations using C program.
3. To learn various techniques for representation of the data in nonlinear fashion
4. To learn advance concept of searching
5. To understand basics of file organization and graphs.

COURSE CONTENTS:

Unit I **[No. of Hours: 10]**

Introduction: Basic Terminology, Data Structure operations, Algorithm Complexity and Time-Space trade-off.
Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, Sparse Matrices. Recursion: Recursive definition and processes, Tower of Hanoi.

UNIT 2 **[No. of Hours: 10]**
Linked Lists: Representation and implementation of singly linked lists, Traversing and Searching of Linked List, Insertion and deletion operation in Linked Lists, Doubly linked list.

UNIT 3 **[No. of Hours: 10]**
Stacks: Array Representation and Implementation of stack, Operations and Stacks: Push and POP, Array Representation of Stack, Linked Representation of stack, Application of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.
Queues: Array and linked representation and implementation of queues, Operations on Queue; Create, Add, Delete, Full and Empty, Circular queue.

Unit 4 **[No. of Hours: 08]**
Trees: Basic terminology, Binary Tree, Binary tree representation, Complete Binary Tree, Traversing Binary trees, Huffman algorithm , Binary Search (BST).

Unit 5 **[No. of Hours: 07]**
Sorting , Searching and Hashing: Selection sort, Insertion Sort, Bubble sorting, Merge Sort Sequential and Binary searching, Hash Table, Hash Function, Collision Resolution Strategies.

TEXT BOOKS:

TB1: Horowitz and Sahani, "Fundamentals of data Structures" Galgotia
TB2: R. Kruse etal, "Data Structures and Program Design in C" Person Education

REFERENCE BOOKS:

RB1: A.M. Tenenbaume , "Data Structures and Program Design in C" Person Education
RB2: Lipschutz, "Data Structure", TMH
RB3: K Loudon, "Mastering Algorithms With C", Shroff Publishers and Distributors

COURSE OUTCOMES (COS):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the CO
CO1	Understand basics knowledge of data structure operations like insertion, deletion etc. for various data structure and their application.
CO2	Analyze the problem and create appropriate algorithm.
CO3	Develop and implement various programs using C for nonlinear data structure.
CO4	Investigate and solve difficulties in the implementation of searching techniques.
CO5	Know application file and graphs in real world.
CO6	Know the application of sorting , searching and hash techniques

PO-CO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	1	1	1	1	1	2	1
CO2	2	3	2	1	2	1			1	1		1
CO3	2	1	3	1	1	1	1	1	1	1	2	1
CO4	2	2	2	3	2	1	1		1	2	1	1
CO5	1	2	2	1	1	1			1	1	2	2
CO6	2	2	1	1	2	1		1	1	1	1	2
AVG	2	2.16	1.83	1.66	1.66	1	0.5	0.5	1	1.17	1.33	1.33

1 – Highest Correlated, 2 – Medium Correlated, 3 – Low Correlated

Course code	**: BITDSC203**				
Course Name	**:Digital Electronics**				
Semester/Year	**: 2nd Sem / 1st Year**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L- Lecture T–Tutorial P – Practical C –Credit

COURSE OBJECTIVES: The objectives of this course are:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design ofdigital systems.
- To understand common forms of number representation in digital electronic circuits and to be able toconvert between different representations.
- To implement simple logical operations using combinational logic circuits.
- To design combinational logic circuits, sequential logic circuits.

COURSE CONTENTS:

UNIT 1 **[No. of Hours: 10]**

Number Systems: Binary, Decimal, Octal, Hexadecimal, Conversion from One Number System to another, Character Codes (BCD), Excess-3, Gray Code, ASCII, 1"s Complement Representation, 2"sComplement Representation
Logic Gates: AND, OR, NOT, XOR, XNOR, NAND and NOR as Universal Gates
Logic Families: Transistor-Transistor Logic (TTL), Emitter-Coupled Logic (ECL).

UNIT 2 **[No. of Hours: 10]**

Boolean Algebra: Boolean postulates and laws , De Morgan"s Theorem, Principle of Duality, Boolean expression, Boolean function, Minimization of Boolean expressions, Sum of Products (SOP), Product of Sums (POS), Minterm- Maxterm, Canonical forms , Karnaugh map Simplification-Don"t care conditions.

UNIT 3 **[No. of Hours: 10]**

Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Serial Adder/ Subtractor, Parallel Adder/ Subtractor, BCD Adder/ Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer

UNIT 4 **[No. of Hours: 10]**

Sequential Circuits: Latch, Flip Flops- SR, JK, Data, Toggle, Counters- Synchronous and Asynchronous, Registers- Serial-in-Parallel-out, Parallel-in-Serial-Out, Parallel-in-Parallel-out, Applications of Flip Flops.

TEXT BOOKS:

TB1. M. M. Mano, Digital Design, 3rd ed., Pearson Education, Delhi, 2003.
TB2. D.P. Leach, Malvino, Guha, Digital Principles and Applications, TMH, New Delhi, 2011.

REFERENCE BOOKS:

RB1. T. L. Floyd and Jain, Digital Fundamentals, Pearson Education, 2003.
RB2. R.J. Tocci and N.S. Widner, Digital Systems - Principles & Applications, PHI, 10th Ed., 2007.

COURSE OUTCOMES:

Upon successful completion of the course as a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify and represent numeric information in different forms.
CO2	Understand machine level representation of data and perform operations on it.
CO3	Apply K-Maps and Tabulation methods for Simplification of Boolean expressions and construct logic circuit.
CO4	Analyze logic circuits and deduce logic expressions and truth tables.
CO5	Evaluate digital number systems and use Boolean algebra theorems, Propertiesand Canonical form for digital logic circuit design.
CO6	Design and analyze small combinational &sequential circuits to build largermore complex circuits.

CO PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	1	2	1	1		1	
CO2	2	1	2	2	2	1	1	1		1		2
CO3	3	2	2	2	1	1	1	1	1	1		1
CO4	2	1	1	3	1	1	1	1		1	2	
CO5	2	1	1	3	1	1	1	1	1			
CO6	3	2	2	2	1	1	1	1				
AVG	2.5	1.33	1.5	2.16	1.33	1	1.16	1	0.5	0.5	0.5	0.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITGE201**				
Course Name	**: CYBER SECURITY AND LAW**				
Semester /Year	**: 2nd Sem / 1st Year**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Learn the foundations of Cyber Security and threat landscape.
- To equip students with the technical knowledge and skills needed to protect and defend against cyber threats.
- To develop skills in students that can help them plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets.
- To expose students to governance, regulatory, legal, economic, environmental, social and ethical contexts of Cyber Security.
- To expose students to responsible use of online Social media network.
- To systematically educate the necessity to understand the impact of cybercrimes and threats with solutions in a global and societal context.
- To select suitable ethical principles and commit to professional responsibilities and human values and contribute value and wealth for the benefit of the society

COURSE CONTENTS

UNIT 1: Introduction to Cyber Security [No. of Hours: 10]

Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World Wide Web, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of Cyber Security, Issues and challenges of Cyber Security.

UNIT 2: Cybercrime and Cyber law [No. of Hours: 10]

Classification of cybercrimes, Common cybercrimes - cybercrime targeting computers, cybercrime against woman and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks., Reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cybercrime, IT Act,2000 and its amendments, Cybercrime and offences, Organizations dealing with Cybercrime and Cyber Security in India, Case studies

UNIT 3: Social Media Overview and Security [No. of Hours: 10]

Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies

UNIT 4: Digital Devices Security, Tools and Technologies for Cyber Security [No. of Hours: 10]

End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.

TEXT BOOKS:

TB1. Cyber Crime Impact in the New Millennium, by Marine R. C, Auther Press.
TB2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.

REFERENCE BOOKS:

RB1. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform.
RB2. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt. Ltd.
RB3. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
RB4. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
RB5. Fundamentals of Network Security by E. Maiwald, McGraw Hill.

COURSE OUTCOMES (COS):

After completion of the course, a student will be able to

CO	Detailed Statement of the CO
CO1	Define a deeper understanding and familiarity with various types of Cyber-attacks, cybercrimes, vulnerabilities and remedies thereto.
CO2	Understand and evaluate existing legal framework and laws on Cyber Security.
CO3	Use the security aspects of social media platform and ethical aspects associated with use of social media.
CO4	Analyze and evaluate the digital payment system security and remedial measures against digital payment frauds.
CO5	Analyze and evaluate the Digital devices security and cyber security risks.
CO6	Create Cyber Security Practices and Configuration of basic security policies and permissions.

CO-PO MAPPING:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	1	1	1				2
CO2	2		2					1	1			
CO3	2	1		2	3	2	1			2		2
CO4	2	1			1	2	3	1	1		2	1
CO5	2		2	2				1	2			2
CO6	3	2		1				1	2	1	2	1
AVG	2.33	1	0.83	1	0.83	0.83	0.83	0.83	1	0.5	0.66	1.33

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITSC201**				
Course Name	**: Indian Knowledge System**				
Semester /Year	**: 2nd Sem / 1st Year**				
	L	**T**	**P**	**C**	
	2		**-**	**2**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVE:

- To introduce students to the foundations of Indian knowledge and heritage.
- To connect ancient Indian scientific and technological concepts with modern disciplines.
- To develop awareness of India's contributions in IT, mathematics, science, and health systems.
- To apply Indian ethical and logical frameworks in modern computing contexts.

COURSE CONTENT:

Unit I: Introduction to Indian Knowledge System

- What is Indian Knowledge System (IKS)?
- Importance and uniqueness of IKS
- Indian education system in ancient times (Gurukula, Nalanda, Takshashila)

Unit II: Science and Mathematics in Ancient India

- Invention of zero and decimal system
- Indian mathematicians: Aryabhata, Bhaskaracharya
- Ancient Indian astronomy
- Traditional units of measurement
- Introduction to Vedic Maths.

Unit III: Indian Technologies and Engineering

- Water harvesting and irrigation systems
- Town planning in Indus Valley Civilization
- Ancient metallurgy (Iron Pillar, Wootz steel)

Unit IV: Health and Wellness Systems

- Basics of Ayurveda
- Yoga and its benefits
- Indian diet systems and daily routines (Dinacharya)
- Naturopathy and holistic health

Unit V: Indian Knowledge and Modern IT

- Indian logic systems and algorithms (e.g. Panini's grammar)
- Indian ethics and values in technology use
- Relevance of IKS in today's digital world

COURSE OUTCOMES (COs):

Successful completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Understand the basics and significance of Indian Knowledge Systems.
CO2	Identify scientific and mathematical contributions of ancient India.
CO3	Describe ancient Indian technologies, engineering, and architecture.
CO4	Relate traditional health systems like Yoga and Ayurveda to modern life and well-being
CO5	Apply Indian logic and ethical values to modern IT and computing practices.

CO PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2			2							
CO2	2			2								
CO3	3				3							
CO4		2		2	2							
CO5	3	3	2		2							
CO6												
AVG	2.75	2.66	2	2	2.25							

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**:**	**AEC-2**			
Course Name	**:**	**Communication Skill: Listening and Speaking Skills**			
Semester /Year	**:**	**2nd Sem / 1st Year**			
		L	**T**	**P**	**C**
		2	**0**	**0**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Students will heighten their awareness of correct usage of English grammar in writing and speaking
- Students will improve their speaking ability in English both in terms of fluency and comprehensibility
- Students will give oral presentations and receive feedback on their performance

UNIT 1: Elementary English **[No. of Hours: 10]**

Grammar: Parts of Speech, Tenses, Short responses, Active and Passive Voice, Vocabulary: Idioms and Phrases, Antonyms, Synonyms, One word substitution, Writing skills: Formal and Informal Letters

UNIT 2: Employability skills **[No. of Hours: 10]**

Communication: Types, Objectives, Formal and Informal Communication, Barriers to communication, Selection of appropriate communication medium, Verbal and Non- verbal Communication. Soft Skills: Public Speaking, Presentation Skills, Speech, Debates, Emotion Management

UNIT 3 : Career Skills **[No. of Hours: 10]**

Interviews, CV Preparation, Group discussion, Personality Development

TEXT BOOKS:

TB1. Fluency in English - Part II, Oxford University Press, 2006.
TB2. Business English, Pearson, 2008.

REFRENCE BOOKS

RB1. Language, Literature and Creativity, Orient Blackswan, 2013.
RB2. Business Communication, Rajender Paul

COURSE OUTCOMES:

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Students will attain and enhance competence in the four modes of literacy: writing, speaking, reading and listening.
CO2	Students will develop their ability as critical readers and writers.
CO3	Develop vocabulary and improve the accuracy in grammar.
CO4	Produce words with right pronunciation
CO5	Demonstrate positive group communication exchanges;
CO6	Plan effective communications.

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2							1			2	
CO2	1	2										
CO3	2	2	1		2			1			2	
CO4	1			2			2			2	1	
CO5	1							1	3		2	2
CO6	2	2	2	1	1		1		3	2	1	2
AVG	1.5	1	0.5	0.5	0.5		0.5	0.5	1	0.66	1.33	0.66

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: CITVC201**				
Course Name	**: THE ART OF CLEAN CODE**				
Semester / Year	**: 2nd Sem / 1st Year**				
		L	**T**	**P**	**C**
		2	**0**	**0**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

- Understand the principles of clean code and its significance in software development.
- Apply coding standards and best practices for writing readable and maintainable code.
- Analyze and refactor existing code to eliminate code smells and improve code quality.
- Implement design patterns to enhance code structure and flexibility.
- Develop effective unit tests using Test-Driven Development (TDD) principles.
- Evaluate and optimize code performance to identify and resolve bottlenecks.
- Create software projects showcasing clean code practices and design patterns.

COURSE CONTENTS:

Unit 1: Introduction to Clean Code and Coding Standards [No. of Hours: 5]

Definition and significance of clean code, The impact of clean code on software development Code readability and maintainability, Naming conventions and meaningful identifiers, Formatting and indentation, Comments and documentation

Unit 2: Refactoring and Code Smells [No. of Hours: 5]

Introduction to code refactoring, identifying code smells, Common refactoring techniques, understanding common code smells and anti-patterns, Refactoring exercises to improve code quality.

Unit 3: Design Principles and Design Patterns [No. of Hours: 5]

SOLID principles, DRY (Don't Repeat Yourself) principle, KISS (Keep It Simple, Stupid) principle, Introduction to design patterns, Creational, Structural, and Behavioral patterns, Applying design patterns to real-world problems.

Unit 4: Debugging, Error Handling, and Performance Optimization [No.of Hours: 5]

Techniques for effective debugging, Proper error handling and exception management, identifying performance bottlenecks, Techniques for optimizing code performance

Text Books:

TB1. Clean Architecture: A Craftsman's Guide to Software Structure and Design by Robert C. Martin

TB2. Code Complete: A Practical Handbook of Software Construction by Steve McConnell

TB3. Working Effectively with Legacy Code by Michael C. Feathers

Reference Books/ Online Resources

RB1. Refactoring: Improving the Design of Existing Code by Martin Fowler
RB2. Design Patterns: Elements of Reusable Object-Oriented Software by Erich Gamma,
RB3. Test-Driven Development: By Example by Kent Beck

Course Outcomes (CO):
After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall the importance of clean code in software development and its impact on project maintainability and collaboration. List and explain the basic coding standards and best practices, including naming conventions, formatting, and code documentation. Identify common code smells and anti-patterns and describe their negative impact on code quality.
CO2	Demonstrate an understanding of various design principles, such as SOLID, DRY, and KISS, and apply them to design cleaner and maintainable code. Explain the purpose and characteristics of different design patterns and illustrate their use in solving specific software design challenges.
CO3	Apply code refactoring techniques to improve existing codebases by eliminating code smells and enhancing code readability.
CO4	Analyze codebases to identify performance bottlenecks and inefficiencies, and propose appropriate optimization strategies..
CO5	Evaluate the trade-offs and benefits of using various design patterns and justify their application in specific software development scenarios.
CO6	Design and implement clean code solutions for real-world software development problems, demonstrating creativity and proficiency in coding practices.

CO –PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	1	2	1	2	2	2
CO2	2	2	3	2	2	2	2	2	2	2	2	3
CO3	1	2	2	1	1	2	1	1	1	1	1	2
CO4	1	2	2	2	2	2	1	1	1	1	2	2
CO5	1	2	2	2	2	2	1	1	1	1	2	2
CO6	3	3	3	3	3	3	2	2	2	2	3	3
AVG	1.8	2.4	2.6	2	2	2.4	1.6	1.8	1.6	1.8	2.2	2.6

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP21**			
Course Name	**: LAB - UNIX**			
Semester	**: 2nd Sem / 1st Year**			
L	**T**	**P**	**C**	
0	**0**	**2**	**1**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Describe the basic file system in Linux and its file attributes.
- Appraise different filters, process handling, regular expressions and network handling features using suitable commands.
- Summarize different Linux commands to write Shell Programs.

LIST OF EXPERIMENTS:

PART-A

1. Introduction- UNIX Architecture- Shell, Kernel, System calls, Comparison between Unix/Linux and other Operating Systems, Applications of Linux Operating System.
2. Internal & External commands in Linux.
   - Internal commands- echo, type, etc.
   - External commands- ls, cp, mv, rm, cat, etc
   - Other commands – tput clear, who, cal, date, bc, man, passwd, uname(with different options).
3. Working with files & directories.
   - Know the categories of files.
   - Directory related Commands – pwd, mkdir, rmdir, cd, ls
   - Manipulating Absolute paths and Relative paths using cd command.
   - File related Commands – cat, cp, mv, rm, comm, cmp, diff, tar, umask, wc
4. Basic File attributes.
   - Listing seven attributes of a file : ls and its options
   - File Permissions: Absolute and Relative permissions
   - Manipulating File permissions using chmod command
   - Manipulating File Ownership using chown command
   - Manipulating Hardlink and Softlink using ln command
5. Learn to use vi editor.

   Three modes of vi editor.
   - Input mode commands.
   - Command mode commands.
   - Ex mode commands.
6. Simple Filters – head, tail, cut, paste, sort, uniq, tr, pr.
7. Expressions & search patterns .(dot operator), *, ^, +, ?, grep, egrep, fgrep
8. Process Management commands.
   - Process creation, status, Identifying process, ps -f & its options,
   - Running process in background, Job control, and Process termination.
   - Changing process priority, scheduling process (Usage of sleep and wait commands)
9. Introduction to shell programming.
   - Introduction, Uses of shell script, Shell special characters, comments, command separator, escaping, quoting command substitution.

- Creating shell script, Shell identifiers, Shell variables, Destroying a variable, Positional parameters & command line arguments.
- Evaluating expressions, Text formatting with echo &tput script termination.

10. Shell control structures
- if, case, for, while, relational and logical operators,
- Advanced filter – sed and awk.

11. Unix system administration Managing file system, Disk management utilities, mounts, umount, df, du, fdisk, su, useradd etc.

12. Unix Environment Introduction, Environment variables, Command prompt system variables, Profiles, files, terminal variable stty command and its options, Command history, editing Environment variable.

PART-B

13. Write a shell script to display current date, time, username and directory.

14. Write script to determine whether given file exist or not, file name is supplied as command line argument, also check for sufficient number of command line argument

15. Write shell script to show various system configuration like: a) Currently logged user name and his long name b) Current shell c) Your home directory

16. Write shell script to show various system configuration like: a) Your operating system type b) Your current path setting c) Your current working directory d) Show all available shells

17. Write a Shell script to accept any two file names and check their file permissions.

18. Write a Shell script to read a file name and change the existing file permissions.

19. Write a shell script to print current month calendar and to replace the current day number by '*'or '**' respectively.

20. Write a C-program to fork a child process and execute the given Linux commands.

21. Write a C-program to fork a child process, print owner process ID and its parent process ID.

TEXT BOOKS:

TB1. "UNIX - Concepts and Applications", Sumitabha Das 4th Edition, Tata McGraw Hill, 2006.

TB2. Stephan Prata: Advanced Unix – A Programmers Guide – BPB PUB.

REFERENCE BOOKS:

RB1. http://heather.cs.ucdavis.edu/~matloff/Linux/LinuxInstall.pdf (Chapter 1, Linux installation).

RB2. Kernighlan&Pike : The Unix Programming Environment – PHI.

COURSE OUTCOMES:

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Able to understand the basic Unix architecture, commands and utilities of the UNIX operating system and to work confidently in Unix/Linux environment and open systems.
CO2	Appraise various command usage of files and directories
CO3	Show the working of vi editor in all its modes using various commands.
CO4	Manage shell and processes using various commands.
CO5	Write Shell scripts and C programs using vi editor. Demonstrate Unix administration and its environment.
CO6	To Create Shell Scripting Programs

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		1		2	2		1			3
CO2	1	2	3	2	3	1	1	1		1	1	1
CO3	3	1		2		2	2		1		1	3
CO4	2	1	1	2	2	1	2	1		1		2
CO5	1	2	2	1	3	2	2		1		1	1
CO6	1		2		3			3		1		
AVG	1.83	1.66	1.33	1.33	1.83	1.83	1.5	0.66	0.5	0.5	0.5	1.66

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP22**
Course Name	**: Lab-Data Structure**
Semester /Year	**: 2nd Sem / 1st Year**

	L	T	P	C
	0	0	2	1

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- To learn basic knowledge about data structure and arrays.
- To learn how to create and use linked list and its applications.
- To learn the importance of static and dynamic use of stack and queues.
- To learn the basic terminology of trees.
- To learn basics of sorting and searching techniques.

COURSE CONTENT:

- Write a program for Push, Pop and display operations on Stack
- Write a program to implement queue Data structure.
- write a program to implement tower of Hanoi problem..
- Write a program for insertion operation in linked list.
- Write a Program to implement Bubble sort .
- Write a program to implement insertion sort .
- Write a program to implement selection sort .
- Write a program for binary search .
- Write a program for Linear search

COURSE OUTCOMES (COS):

Upon successful completion of the course as a student will be able to

CO#	Detailed Statement of the CO
CO1	Able to understand basics of C programming language and arrays.
CO2	Able to understand basic concepts of linked list.
CO3	To understand the basic concepts of stack and queues through array and linked list.
CO4	To understand the basic knowledge of trees and graph.
CO5	Able to understand the concepts of sorting and searching techniques.
CO6	Able to understand Tree

CO PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		1	2	1	1	1		1		2
CO2	2	3	2	1	2	1	1	1	1	1		
CO3	2	1	3		1	1	1			2		2
CO4	2	2	2	3	2	1	1	1	1	1	2	1
CO5	1	1				3	1	1	2	1		2
CO6	2		2	1	1	1	1	1	2	1	2	1
AVG	2	1.5	1.5	1	1.33	1.33	1	0.83	1	1.16	0.66	1.33

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

THIRD SEMESTER:

Course code	**: BITDSC301**			
Course Name	**:DBMS**			
Semester /Year	**: 3rd Sem/2nd Year**			
	L	**T**	**P**	**C**
	3	**-**	**-**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Develop a broad understanding of database concepts and database management system software, data models, schemas and instances, data constraints, relational algebra and calculus.
- Acquire Knowledge to model an application data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
- Be able to write SQL commands to create and manipulate database objects.
- Be able to discuss importance of normalization and improve the database design by applyingvarious normal forms.

COURSE CONTENTS:

UNIT 1 **[No. of Hours: 8]**

Introduction: An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence, Overall Database structure.

UNIT 2 **[No. of Hours: 5]**

Data modelling using Entity Relationship Model: ER model concepts, notation for ER diagram , keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation.

UNIT 3 **[No. of Hours: 9]**

Relational Data Model and Language: Relational data model concepts, Codd's rule, integrity constraints: entity integrity, referential integrity, constraints, relational algebra, relational calculus, tuple and domain calculus.

UNIT 4 **[No. of Hours: 10]**

Introduction to SQL: Characteristics of SQL, SQL data types and literals, Types of SQL commands, DDL, DML, DQL, SQL operators, Queries and sub queries, Aggregate functions, group by, order by, view, Joins, constraints.

UNIT 5 **[No. of Hours: 8]**

Database Design & Normalization: Functional dependencies, normal forms, first, second third normalforms, BCNF, Multi valued Dependencies, 4NF, 5NF loss less and lossy join decomposition.

TEXT BOOKS:

TB1: Korth, Silbertz, Sudarshan, "Database Concepts" McGraw Hill

REFERENCE BOOKS:

RB1: Date C.J. "An Introduction to Database System". Addision Wesley
RB2: Elmasri, Navathe, "Fundamentals of Database systems" Addision Wesley
RB3: Bipin C. Desai, "An introduction to Database Systems", Galgotia Pub.

COURSE OUTCOMES:

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define various database components, models, DBMS architecture and Database Security.
CO2	Explain relational database theory to construct relational algebra expression, tuple and domain relation expression for SQL queries
CO3	Apply the concept of database to write advanced SQL queries on data.
CO4	Compare various normal forms and perform normalization and functional Dependency for database.
CO5	Appraise concept of functional dependencies and keys.
CO6	Create database using SQL queries

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		3	1	1	1	1			2	
CO2	3	3	3	2	1	1	1					
CO3	3	3	3	2	3	1	1	1	2		2	
CO4	3	3	3	2	1	1	1			2	1	
CO5	3	3	2	2	1	1	1				2	2
CO6	3	3	3	2	3	1	1	1	1	1	1	2
AVG	3	3	2.33	2.16	1.66	1	1	0.5	0.5	0.5	1.33	0.66

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSC302**				
Course Name	**: Web Technologies**				
Semester /Year	**: 3rd Sem/2nd Year**				
		L	**T**	**P**	**C**
		3	**-**	**-**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- To learn the basic concepts of World Wide Web.
- To learn the basic concepts and syntax of HTML and CSS programming.
- To be able to develop logics which help them to create programs and applications using HTML& CSS.
- To use JavaScript in a program
- To learn the skills that will help the students in creating websites with great look and feel using CSS and JavaScript

UNIT 1 **[No. of Hours: 10]**

Introduction to HTML:

Basics of HTML, formatting, and fonts, commenting code, hyperlink, tables, images, forms, Meta tags, Character entities, frames and frame sets, Overview and features of HTML5.

UNIT 2 **[No. of Hours: 10]**

Page Formatting- Adding a New Paragraph, Adding a Line Break, Inserting Blank Space, Preformatted Text, Changing a Page's Background Color, Div Element. Text Items and Objects: Headings, Comments, Block Quotes, Horizontal Lines. Special Characters, Creating Lists- Numbered (Ordered) Lists, Bulleted (Unordered) Lists, Nested Lists, Definition Lists.

UNIT 3 **[No. of Hours:05]**

Links- Text Links, Image Links, Opening a Page in a New Window or Tab, Setting all Links on a Page to Open in a New Window or Tab, Linking to an Area on the Same Page (Bookmarks), Linking to an E-mail Address, Linking to Other Types of Files, Images- Introduction to Images for Webpages, Adding Images to Webpages, Resizing an Image, Alternative (ALT) Text, Image Labels.

UNIT 4 **[No. of Hours: 05]**

Cascading Style Sheets- Style Sheets:

Need for CSS, Introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

UNIT 5 **[No. of Hours: 10]**

Introduction to JavaScript: Advantage of JavaScript, JavaScript Syntax - Datatype - Variable - Array - Operator and Expression - Looping Constructor - Function - Dialog box.

TEXT BOOK:

TB1. HTML & CSS: The Complete Reference, Fifth Edition, Thomas A. Powell.
TB2. Burdman, "Collaborative Web Development", Addison Wesley

REFERENCE BOOK

RB1. Sharma & Sharma, "Developing E-Commerce Sites" Addison Wesley
RB2. Ivan Bayross, "Web Technologies Part-I" BPB Publications

COURSE OUTCOMES:

Upon successful completion of the course as a student will be able to

CO#	Detailed Statement of the CO
CO1	Able to understand the basic concepts and write HTML programs.
CO2	Able to design and develop various programming problems using CSS programming concepts.
CO3	Able to Implement concepts like changing look-n-feel of the multiple web pages from single source using CSS.
CO4	Able to decide which type of style sheet is suitable to use in particular case by analyzing the inline, internal and external type of CSS.
CO5	Able create and evaluate the websites with professional look and feel using both HTML and CSS.
CO6	Create web pages using HTML, CSS and Javascript

CO PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	1	1	1	1	2	1	1	
CO2	2	2	3	1		1	1		1	1	1	
CO3	1	3	3	1	1		1	1	2	1	1	
CO4	2	3	3	1			1			1	1	
CO5	3	3	1	1	2		1	1		1	1	1
CO6	3	3	1	1	2	1	1				1	
AVG	2.33	2.66	2.33	1	1	.5	1	.5	0.83	1	1	0.16

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSC303**				
Course Name	**: Computer Network**				
Semester /Year	**: 3rd Sem/2nd Year**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- To understand the concepts of communicating channel in order to deal with the differenttransmission media.
- To learn different about the different approaches of networking through switching modes anddifferent multiplexing techniques.
- To learn the importance of IEEE standard to raise good results and modes to apply various protocols internally and externally in specified time domain. To deal with the problems arises dueto channel allocation and ultimately to detect collisions so as to avoid them on priority basis.
- To learn different models o transfer data through physical communicating medium with the helpof routing algorithms. To analyze the features of different algorithms to find a short way to approach to the destination.
- To understand significance of various layers in OSI as well as TCP/IP models to bring a data in segment form and to synchronize the interaction of source and destination using respective layers.
- To draw elementary knowledge regarding different known systems that provide variouscharacteristics, when number of protocols are applied to secure the data.

COURSE CONTENT:

UNIT 1: Overview of Networking **[No. of Hours: 8]**

Introduction, Need of Networking; Elements of Network, Modes of communication, Network topology, categories of network (LAN, MAN, WAN), Reference models: OSI reference model, TCP/IP reference model.

Physical Layer: transmission media (guided & unguided), TDM, FDM, Circuit switching: time division& space division switch, Telephone network.

UNIT 2: Data link layer [No. of Hours: **8]**

Framing (character and bit stuffing), Types of errors , error detection & correction methods; Flow control: Protocols: Stop & wait ARQ, Sliding Window Protocols, HDLC Medium access sub layer: Channel Allocation, LAN Protocols, , CSMA/CD/CA, ALOHA protocols, Multiplexing.

UNIT 3: Network layer [No. of Hours: **8]**

Internetworking devices, Routing: Routing types & techniques, static vs. dynamic routing; Routing algorithms: flooding, distance vector routing, link state routing; network layer Protocols: ARP, RARP, ICMP; IP Addressing: class full address, subnetting, IPv4 and datagram, IPv6, Congestion control strategies & algorithms.

UNIT 4: Transport layer [No. of Hours: **8**]

Design issues, Connection management, TCP window Management, Port No., Socket Address, UserDatagram Protocol, Transmission Control Protocol.

UNIT 5: Application layer [No. of Hours: **8**]

E-mail, SMTP, FTP, POP, SNMP,TFTP, HTTP; Introduction to Network Security: Terminology andKeys Symmetric and Asymmetric Algorithm.

TEXT BOOKS:

TB1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH

REFERENCE BOOKS:

RB1. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
RB2. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	To gain knowledge and remember Computer network and communication term, network protocols, functions of different layers, media, mode etc.
CO2	To understand computer network and communication term, network protocols, functions of different layers, media, mode etc.
CO3	To apply Computer network protocols, methods of error detection to solve problem related to computer network
CO4	To analyze Computer network term, protocols, functions of different layers, media, mode etc.
CO5	To evaluate various numerical based on bandwidth, error detection ,channel allocation, efficiency of algorithms, routing ,Congestion, TCP etc.
CO6	To create new protocols and method to solve real life problems in a computer network environment.

CO PO MAPPING:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1			1	1					2	
CO2	1		1	2	1					1		2
CO3	2	3		1	1	1		1	2		2	
CO4	1	2	2	1		2	1			1	2	
CO5		1	1	2	1	2		1			1	
CO6	1			2				1	1	1	1	2
AVG	1.16	1.16	0.66	1.33	0.66	1	0.16	0.5	0.5	0.5	1.33	0.66

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITGE301**			
Course Name	**:Artificial Intelligence**			
Semester /Year	**: 3rd Sem/2nd Year**			
	L	**T**	**P**	**C**
	3	**1-**	**-**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

Course Objectives: The objectives of this course are

1. To impart knowledge about Artificial Intelligence.
2. To give understanding of the main abstractions and reasoning for intelligent systems.
3. To enable the students to understand the basic principles of Artificial Intelligence in various

COURSE CONTENT

Unit I **[No. of Hours: 8]**

Introduction:- Definition and meaning of artificial intelligence, A.I. techniques, pattern recognition, Level of, speech recognition representation in A.I. properties of internal representation.

Unit II **[No. of Hours: 8]**

Production System:- Different types of tracing, strategies, graph search strategies, Heuristic graph, search procedure, AND/OR graph, relationship between decomposional and compatible systems, searching Gate Tree, min-max search game playing, actual game playing.

Unit III **[No. of Hours: 8]**

Introduction to Predicate Calculus:- Predicates and Arguments, connectives, Simplifications of strategies, extracting answers from Resolution Refutation. Control strategies.

Unit IV **[No. of Hours: 8]**

Rule Based Deduction Systems: Forward and backward deduction system, resoling with AND/OR graph, computation, deduction and program synthesis, central knowledge for rules based deduct systems.

Unit V **[No. of Hours: 8]**

Structural Object Representation: Semantic networks semantic market matching deductive operations on structured objects. Architectural for A.I. Systems: Knowledge, acquisitions representation, Natural language processing.

Text Books:

TB1. Introduction to artificial Intelligence Eugene Charnik Drew MC mott

TB2. Artificial Intelligence Elaine Rice.

Reference Books:

RB1. Principal of Artificial Intelligence, Nelson, Springer-Verlag.

RB2. Artificial Intelligence Application Programming: Tim Jones, Wiley dreamtech

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Demonstrate fundamental understanding of the history of AI
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI
CO4	Apply different search algorithms
CO5	Understand Natural Language Processing
CO6	Plan heuristic algorithm

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1			2						
CO2	2	3	2		2							
CO3	2			2		2	1					
CO4			2		2							
CO5	2	2		2		2						
CO6	1	1	1	2			2	2				
AVG	1.66	1.33	1	1.0	0.8	1.2	0.5	0.33				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITSC301**				
Course Name	**:Digital Marketing**				
Semester /Year	**: 3rd Sem/2nd Year**				
		L	**T**	**P**	**C**
		2	**-**	**-**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Overall understanding of Digital Marketing.
- Various strategies involved in Marketing products and Services Digitally.
- Understanding of Digital Marketing Platforms.
- Techniques for Search Engine Optimization (SEO) and Mobile Marketing.
- Develop insight on Current Trends–Digital and Social Statistics (Info graphics).

COURSE CONTENTS:

UNIT 1 **[No. of Hours: 5]**

Introduction to Digital Marketing: Evolution of Digital Marketing from traditional to modern era, implications for business & society, Emergence of digital marketing as a tool, Digital marketing strategy, P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models

UNIT 2 **[No. of Hours:6]**

Internet Marketing and Digital Marketing Mix: Internet Marketing, opportunities and challenges, digital marketing framework, Digital Marketing mix, Impact of digital channels on IMC

Email Marketing: Basics of Email Marketing, Opt-in Email Permission Marketing, Online PR, Interactive Advertising, Online Partnerships, Viral Marketing, Blogs

Display Marketing: Types of Display Ads, Buying Models, Programmable Digital Marketing, Analytical Tools, YouTube Marketing, Trends

UNIT 3 **[No. of Hours: 5]**

Social Media Marketing–Role of Influencer Marketing, Tools &Plan: Introduction to s social media platforms, penetration & characteristics, Building a successful social media marketing strategy

Facebook Marketing: Introduction to Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools.

Mobile Marketing: Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, And Mobile Advertising Analytics.

UNIT 4 **[No. of Hours: 5]**

Introduction to Search Engine Optimization(SEO): Introduction and need for SEO, search engine and its working pattern, On-page and off-page optimization, SEO Tactics, Introduction to Search Engine Marketing (SEM).

TEXTBOOKS:

TB1 Seema Gupta, "Digital Marketing", Mc-Graw Hill, 8th Edition, 2018.

TB2 Ian Dodson, "The Art of Digital Marketing", Wiley, 2017

REFERENCE BOOKS:

RB1 Chhafey D., Ellis-Chadwick F., Johnston K .and Mayer R, "Internet Marketing: Strategy, Implementation and Practice" , PearsonEducation, 2018.

RB2 Strauss, Judy and Frost, Raymond,"E-Marketing",PHILearningPvt.Ltd.,2013.

RB3 PuneetSinghBhatia,"FundamentalsofDigitalMarketing",Pearson,2nd Edition,2016.

COURSE OUTCOMES (COs):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Describing Digital Marketing preliminaries.
CO2	Explaining effective Digital Marketing strategies for different products and services.
CO3	Illustrate varied Digital Marketing Platforms like Email, Facebook, Twitter, YouTube, Pinterest, etc. as per given scenario.
CO4	Analyze the concept of Search Engine Optimization (SEO), SEM and Mobile Marketing to given scenarios.
CO5	Evaluate trends using Google Analytics.
CO6	Create a plan to apply digital marketing knowledge to business situations in local and global environment.

PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3	3	2					1				
CO3	2	2	1					3				
CO4	1	1	2	2	2	1					1	
CO5	1	2	2	2	2	1	1	1	1	1	1	1
CO6	3	2	2	2	1						2	
AVG	2.33	1.66	1.5	1	0.83	0.33	0.16	0.66	0.16	0.16	0.66	0.16

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: AEC3**				
Course Name	**: Environmental Studies-II**				
Semester /Year	**: 3rd Sem/2nd Year**				
		L	**T**	**P**	**C**
		2	**-**	**-**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Unit I. Environmental Pollution and HealthCourse Learning Outcomes

After completing this unit, students would be able to:

- Develop an understanding of pollution and its types.
- Learn about sources of different kinds of pollution.
- Sensitize themselves to adverse health impacts of pollution.

UNIT OUTLINE

- Definition of pollution; Point sources and non-point sources of pollution.
- Air pollution: Sources of air pollution; Primary and secondary pollutants; Criteria pollutants; Other important air pollutants- (VOCs), (PAN), (PAHs) and (POPs); Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards.
- Water pollution: Sources of water pollution; river, lake and marine pollution, groundwater pollution; water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life.
- Soil pollution and solid waste: Soil pollutants and their sources; Solid and hazardous waste; Impact on human health.
- Noise pollution: Definition of noise; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health.
- Thermal and radioactive pollution: Sources and impact on human health and ecosystems.

Suggested Readings:

1. Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment andHuman Impact. Pearson Education.

2. Masters, G. M., & Ela, W. P. (2008). Introduction to environmental engineering and science (No.60457). Englewood Cliffs, NJ: Prentice Hall.

3. Miller, G. T., & Spoolman, S. (2015) Environmental Science. Cengage Learning.

4. Central Pollution Control Board Web page for various pollution standards. https://cpcb.nic.in/

5. Ahluwalia, V. K. (2015). Environmental Pollution, and Health. The Energy and ResourcesInstitute (TERI).

Unit II. Climate Change: Impacts, Adaptation and Mitigation

Course Learning Outcomes

After completing this unit, students would be able to:

• Gain a comprehensive knowledge of climate change, its science and response measures
• Have an overview of national and global efforts to address climate change adaptation and mitigation.

UNIT OUTLINE

- Structure of atmosphere; Climate Change, GHGs (greenhouse gas emissions).
- Paris Agreement; Climate change projections for the Indian sub-continent. Impacts, vulnerability and adaptation to climate change: Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment.
- Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change.
- Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept of carbon intensity, energy intensity and carbon neutrality.
- National and international policy instruments for mitigation, decarbonizing pathways and net zero targets for the future; National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice.

Suggested Readings

1. Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge.

2. www.ipcc.org; https://www.ipcc.ch/report/sixth-assessment-report-cycle/.

3. Adenle A., Azadi H., Arbiol J. (2015). Global assessment of technological innovation for climate change adaptation and mitigation in developing world, Journal of Environmental Management, 161 (15): 261-275.

4. Barnett, J. & S. O'Neill (2010). Maladaptation. Global Environmental Change—Human and Policy Dimensions 20: 211–213.

5. Berrang-Ford, L., J.D. Ford & J. Paterson (2011). Are we adapting to climate change? Global Environmental Change—Human and Policy Dimensions 21: 25-33.

IT III. Environmental Management

Course Learning Outcomes

After completion of this unit, students would be able to:

- Develop a critical understanding of the complexity of environmental management.
- Understand broad aspects of environmental management systems.
- Understand different methods of assessing environmental quality and associated risks.

Unit Outline

- Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control.
- Environmental management system: ISO 14001. Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis.
- Environmental audit and impact assessment; Environmental risk assessment Pollution control and management.
- Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Eco mark scheme.

Suggested Readings

1. Jørgensen, Sven Marques, Erik João Carlos and Nielsen, Søren Nors (2016) Integrated Environmental Management, A transdisciplinary Approach. CRC Press.

2. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.

3. Barrow, C. J. (1999). Environmental management: Principles and practice. Routledge.

4. Tiefenbacher, J (ed.) (2022), Environmental Management - Pollution, Habitat, Ecology, and Sustainability, Intech Open, London. 10.5772/

5. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.

Unit IV. Environmental Treaties and Legislation

Course Learning outcomes

After completion of this unit, students would be able to:

- Learn about how the nations of the world work together for the environment.
- Learn about the major international treaties and our country's stand on and responses to the major international agreements.
- Learn about major international institutions and programmes and the role played by them in the protection and preservation of the environment.

Unit Outline

- Major International Environmental Agreements: Convention on Biological Diversity (CBD); Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Ramsar Convention on Wetlands of International Importance; United Nations Convention to Combat Desertification (UNCCD); Montreal Protocol on Substances that Deplete the Ozone Layer and the Kigali Amendment; Minamata Convention on Mercury; United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement; India's status as a party to major conventions.
- Major Indian Environmental Legislations: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; Noise Pollution (Regulation and Control) Rules, 2000; Waste management rules.
- National Green Tribunal; United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), World Commission on Environment and Development (WCED), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC), and Man and the Biosphere (MAB) programme.

Suggested Readings

1. UNEP (2007) Multilateral Environmental Agreement Negotiator's Handbook, University of Joensuu, ISBN 978-952-458-992-5

2. Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp- content/uploads/2020/02/ convention-V-16-CURVE-web.pdf

3. Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press.

4. India Code – Digital repository of all Central and State Acts: https://www.indiacode.nic.in/ 5. Bohra, Saroj, Judicial Intervention and Evolution of Environmental Principles and Doctrines

(January 7, 2019). Available at SSRN: https://ssrn.com/abstract=3311406 orhttp://dx.doi. org/10.2139/ssrn.3311406

- Discussion on one international case study related to the environment and sustainable development.
- Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.
- Participation in cleanliness drives and nature camps.
- Campus environmental management activities such as solid waste disposal and management.
- Campus environmental management activities such as water management and sanitation, and sewage treatment.

- Case Studies on any one Pollution related Disaster: (Bhopal Gas Tragedy, Chernobyl Disaster, London smog, Delhi Smog, Minamata Disaster).
- Prepare a brief report on any one Environment related Treaty/Protocol: (Kyoto Protocol, Montreal Protocol, CITES, Paris Agreement, CBD).
- Prepare a map highlighting the Ramsar Sites of India.

Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall key concepts, definitions, and types of environmental pollution, major international environmental agreements, and fundamental principles of environmental management.
CO2	Understand the sources and impacts of different types of pollution on humanhealth and ecosystems, the intricacies of climate change, and the significance of international environmental treaties and domestic legislations.
CO3	Apply knowledge to identify local and regional environmental issues during field visits, participate in environmental management activities, and documentobservations on various environmental topics.
CO4	Analyze the causes and effects of environmental disasters, the implications of environmental treaties and protocols, and evaluate the effectiveness of different environmental management systems.
CO5	Assess the global and national efforts in addressing climate change, the effectiveness of environmental laws and regulations, and the role of major international institutions and programmes in environmental conservation.
CO6	Design and formulate reports on specific environmental case studies, such as pollution-related disasters and international treaties, and create informative maps highlighting significant environmental sites, like the Ramsar Sites of India.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	1	2	1	1	1	1	1	2	1
CO2	1	2	2	2	3	1	1	1	1	2	2	2
CO3	1	3	2	2	2	2	2	1	1	2	3	2
CO4	1	3	2	3	2	2	2	1	1	2	3	3
CO5	1	2	2	2	3	2	2	1	1	2	2	2
CO6	1	2	2	2	3	2	3	1	1	2	2	2
AVG	**1**	**2.33**	**1.83**	**2**	**2.5**	**1.67**	**1.83**	**1**	**1**	**1.83**	**2.33**	**2**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: CITVC301**				
Course Name	**: Introduction to Data Science**				
Semester / Year	**: 3rd Sem / 2nd Year**				
		L	**T**	**P**	**C**
		2	**0**	**0**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Introduce core concepts of data science, including data types, statistics, and the role of data scientists in solving real-world problems.
2. Develop hands-on skills in data collection, cleaning, visualization, and basic machine learning.
3. Train students to perform exploratory data analysis (EDA), identify patterns, and derive actionable insights from structured/unstructured datasets.
4. Highlight ethical challenges in data science, including bias, privacy, and security, to foster responsible data-driven decision-making.
5. Enable students to design and present end-to-end data science projects, integrating technical skills with teamwork and communication (CRISP-DM framework).

COURSE CONTENTS

Unit 1: Foundations of Data Science **[No. of Hours: 6]**

Introduction to Data Science: Overview, importance, and applications; Role of data scientists; Types of data (structured, unstructured, semi-structured).

Data Collection and Preprocessing: Data sources; Data cleaning techniques; Handling missing data; Data transformation and normalization.

Basic Statistics for Data Science: Descriptive statistics (mean, median, mode, variance); Probability basics; Data distributions (normal, binomial).

Unit 2: Data Analysis and Visualization **[No. of Hours: 7]**

Exploratory Data Analysis (EDA): Techniques for EDA; Identifying patterns and outliers; Correlation and causation.

Data Visualization: Principles of effective visualization; Tools (e.g., charts, graphs, heatmaps); Interpreting visual data.

Introduction to Data Science Tools: Overview of Python/R for data science; Introduction to libraries (e.g., Pandas, Matplotlib).

Unit 3: Introduction to Machine Learning and Ethics **[No. of Hours: 7]**

Fundamentals of Machine Learning: Supervised vs. unsupervised learning; Basic algorithms (e.g., linear regression, k-means clustering); Model evaluation basics.

Data Science Workflow: CRISP-DM framework; Steps from problem definition to deployment; Case studies.

Ethics and Challenges in Data Science: Data privacy and security; Bias in data and algorithms;

Ethical considerations in data-driven decisions.

Text Books

TB1. Pandas for everyone, Python Data Analysis by Daniel Y. Chen, Pearson publication

TB2. Laura Igual, Santi Seguí, "Introduction to Data Science - A Python Approach to Concepts,

Reference book:

RB1. Wes McKinney, "Python for Data Analysis", O'Reilly

RB2. Luca Massaron, John Paul Mueller, "Python for Data Science for Dummies"

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall fundamental concepts of data science, including data types (structured/unstructured), descriptive statistics, and key terminologies.
CO2	Explain the data science workflow (CRISP-DM), ethical challenges, and the role of visualization in interpreting data.
CO3	Perform data preprocessing (cleaning, normalization) and basic statistical analysis.
CO4	Identify patterns, outliers, and correlations in datasets using exploratory data analysis (EDA) techniques.
CO5	Assess the appropriateness of machine learning models (e.g., linear regression vs. clustering) for given problems and critique ethical implications of data-driven decisions.
CO6	Design and present a complete data science project (from data collection to visualization) to solve a real-world problem.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	2	1	1	2	1	1	1
CO2	2	2	2	2	3	2	1	1	1	2	2	1
CO3	3	2	3	3	1	3	2	2	3	2	1	2
CO4	2	3	3	3	1	2	2	2	2	2	2	2
CO5	1	2	2	2	3	2	2	2	1	2	2	2
CO6	2	3	3	3	2	3	3	3	2	3	3	3
AVG	2.2	2.2	2.5	2.3	1.8	2.3	1.8	1.8	1.8	2	1.8	1.8

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP31**			
Course Name	**: Lab -DBMS**			
Semester /Year	**: 3rd Sem/2nd Year**			
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Working expertise of DDL and DML commands with their application on solving real timeproblems.
- Ability to apply filters using where clause and nested queries, integrity constraints attainable level and column level and to use built-in functions including numeric, character and date functions.
- Adequate knowledge to fetch data from multiple tables using different types of JOIN operations.

COURSE CONTENTS:

1. Queries used for creating and managing tables i.e. Data Definition Language (DDL) e.g., createtable, alter table, drop, rename table etc.
2. Queries used for manipulating data i.e. Data Manipulation Language (DML) e.g., inserting rows intoa table, update rows in a table, delete rows from a table,
3. Writing and executing basic SQL queries
4. Including constraints while creating tables.
5. Queries based on restricting and sorting data
6. Queries based on single row functions used in character, number and date.
7. Queries based on displaying data from multiple tables.
8. Aggregating data using group functions
9. Queries based on sub queries.
10. Describing and creating view, retrieving data through a view, alter definitions of a view, insert,delete and update data through a view, drop a view

COURSE OUTCOMES:

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of
CO1	Identify DML/DDL commands and write queries based on them .
CO2	Demonstrate the use of constraints, relational algebra operations and Grouping.
CO3	Apply the concept of Views, Rollback, Commit, Grant and Revoke Permission.
CO4	Examine SQL queries and developing database applications.
CO5	Appraise solutions for real world problems/case studies by creating efficient databaseschema.
CO6	Creation of queries in SQL

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	2	3	2	1		1	1		
CO2	2	1	2	1	2	1		1	1	1		
CO3	3	1		1	1	1	2		1	1		
CO4	1	1	3	2	1		3	1	1	1	2	1
CO5	1	1	2			1	2	2	1	1	3	
CO6	1	1	2			1	2	2	1	1	3	
AVG	1.5	1	2	1	1.16	1	1.66	1	1	1	1.33	0.16

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP32**			
Course Name	**: Lab- Web Technologies**			
Semester /Year	**: 3rd Sem/2nd Year**			
L	**T**	**P**	**C**	
0	**0**	**2**	**1**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- To learn the basic concepts of World Wide Web.
- To learn the basic concepts and syntax of HTML and CSS programming.
- To be able to develop logics which help them to create programs and applications using HTML& CSS language.
- To use the types of CSS and CSS Overriding in a web site.

COURSE OUTCOMES:

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	To gain knowledge about the basic concepts of HTML and CSS.
CO2	To understand the basic concepts of HTML and CSS.
CO3	To apply html and CSS into programming concepts
CO4	To analyze the different style of CSS in particular cases (inline/internal/external)
CO5	To evaluate various codes of basic html and variety of style sheets for designing web pages
C06	To create websites with professional look and feel using both HTML and CSS.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	1		1		2			
CO2	3						2		1	1		
CO3	2	2	3	1			1		1			
CO4	1	3	3						2			
CO5	2	3	3									
CO6	2			1			2		2			
AVG	2.16	1.16	2	0.5	0.16		1		1.33	0.16		

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

FOURTH SEMESTER:

Course code	**: BITDSC401**				
Course Name	**: Java Programming**				
Semester /Year	**: 4th Sem/ 2nd year**				
	L	**T**	**P**	**C**	
	3	**0**	**0**	**3**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

Course Objectives: The objectives of this course are

In this course, you will learn about:

1. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc. and exception handling mechanisms.
2. To understand streams and efficient user interface design techniques.
3. Understand the principles of inheritance, packages and interfaces.

COURSE CONTENTS

UNIT-I **[No. of Hours: 10]**

Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Single and Multidimensional Array, String class, String Buffer class, Operations on string, Use of Wrapper Class.

UNIT-II **[No. of Hours: 10]**

Class, Object, Constructor, Constructor Overloading, Method Overloading, new operator, this and static keyword, finalize () method, Access modifiers, Nested class, Inner class, Abstract class. Inheritance and its types, method overriding, super keyword, Final keywords, interface, instance of operator.

UNIT-III **[No. of Hours: 8]**

Package, Import statement, Exception Handling, Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception , Throwable Class. Multithreaded Programming, Use of Multithread programming, Thread class and Runnable interface, Thread priority.

UNIT-IV **[No. of Hours: 7]**

Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader, Collection Classes List, ArrayList, Enumeration, Vector, Properties, Introuduction to Java.util package.

UNIT V **[No. of Hours: 5]**

Introduction to AWT, GUI components Button, TextField, ComboBox etc. Introduction to

swings, Event Handling.

Text Books:

TB1. Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.

TB2. Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

Reference Books:

RB1. Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

RB2. Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD

RB3. The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.

RB4. Java Programming, D. S. Malik, Cengage Learning.

RB5. Big Java, 3rd Ed., Horstmann, Wiley-India.

Course Outcomes (CO):

On completion of the course the student should be able to:

CO#	Detailed Statement of the CO
CO1	Understanding the syntax and semantics of java programming language, basic concepts of OOP implementation and use of a variety of basic control structures including selection and repetition, classes and objects.
CO2	Knowledge about primitive and reference data types including composition; basic AWT components; file-based I/O; and arrays.
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
CO4	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes
CO5	Design event driven GUI and web related applications which mimic the real word scenarios.
CO6	Plan Files handling program

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1		1		3		1		1	
CO2	3	2	2	1	2	1	3	2	2	2	3	1
CO3	3	2	2	1	2	1	3	2	2	2	3	3
CO4	3	2	3	2	2	1	3	2	2	3	3	3
CO5	3	2	2	1	3	1	3	2	3	2	2	3
CO6	1	1	1	1	1	1	1					
AVG	**2.5**	**1.66**	**1.83**	**1**	**1.83**	**0.83**	**2.66**	**1.6**	**2**	**1.8**	**2.4**	**2**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSC402**				
Course Name	**: Python Programming**				
Semester /Year	**: 4th Sem/ 2nd year**				
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

L - Lecture T – Tutorial P – Practical Ç – Credit

Course Objectives: The objectives of this course are

1. Master the core of writing Python scripts
2. Understand decision-making and functions in python
3. Interpret Object-oriented programming features in python
4. Gain knowledge of data structures in python
5. Explore file handling and database operations in python

COURSE CONTENTS

Unit I **[No. of Hours: 10]**

Introduction: History, Features, Basic Syntax, Variable and Data Types, Operator, Conditional Statements: If, If- else, Nested if-else, Looping: For, While, Nested loops, Control Statements: Break, Continue, Pass

Unit II **[No. of Hours: 11]**

String: Accessing Strings, Basic Operations, String slices, Function and Methods. **Lists**: Introduction, accessing list, Operations, working with lists, Function and Methods, sorting, searching

Tuple: Introduction, accessing tuples, Operations, Working, Functions and Methods

Sets: Introduction, Accessing sets, Operations, Working, Functions and Methods. **Dictionaries**: Introduction, accessing values in dictionaries, Working with dictionaries, Properties, Functions.

Unit III **[No. of Hours: 7]**

Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables, Python Lambda, recursion. Modules: Importing module, Math module, Random module, Packages, Composition

Unit IV **[No. of Hours: 7]**

Input-Output: Printing on screen, reading data from keyboard, **File Handling:** Opening and closing file, Reading and writing files. **Database handling using SQLite3. Exception Handling:** Exception, Except clause, Try, finally clause, User Defined Exceptions

Unit V **[No. of Hours: 5]**

OOPs concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding.

Text Books:

TB1. Budd T A, "Exploring Python", McGraw-Hill Education, 1st Edition, 2011.

TB2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2013.
TB3. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 1st Edition,2013.

Reference Books:

RB1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs", Cengage Learning, 1st Edition, 2011.
RB2. Allen Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly, 2nd Edition, 2015.
RB3. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, 1st Edition, 2017.
RB4. Joel Grus, "Data Science from Scratch", O'Reilly, 2nd Edition, 2019.
RB5. Tony Gaddis, "Starting out with Python", Pearson, 3rd Edition, 2014.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Knowledge and remember the programming constructs used in python.
CO2	Understanding the facts behind the sequences, functions, modules, files, database and object oriented etc. used in Python
CO3	Apply data structure primitives like strings, lists, tuples, sets and dictionaries on various types of data with or without using functions, object-oriented concepts to the programs in Python etc.
CO4	Distinguish and analyze basic constructs of Python and how constructs can be used all together.
CO5	Evaluate the programming constructs of Python to provide verdict on findings.
CO6	Create python programs using various programming constructs of Python.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1		2				2		
CO2	3	3	3	2	1	1				2		
CO3	3	3	3	2	1	1						
CO4	3	3	3	2	1	1	1	1		2	1	
CO5	3	3	3	2	1	1			2			2
CO6	3	3	3	3	1	1	1	1	1	1	1	1
AVG	**3**	**5.3**	**5.3**	**2**	**0.8**	**1.2**	**0.3**	**0.3**	**0.5**	**1.2**	**0.3**	**0.5**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BITDSC403				
Course Name : Design and Analysis of Algorithms				
Semester /Year: 4th Sem/ 2nd year				
	L	T	P	C
	3	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understand the important concepts of algorithms design and their analysis.
2. Analyze the efficiency of alternative algorithmic solutions to the problem.
3. Understand different algorithm paradigms like Divide and Conquer, Greedy, Dynamic, Backtracking and Branch and Bound.
4. Identify the appropriate data structures, algorithm design techniques and assess their impact on the performance of programs

COUSE CONTENTS

UNIT-I **[No. of Hours:09]**

Algorithms, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms Growth of Functions: Asymptotic notations, Recurrences and Solution of Recurrence Equations, The Master Method.

UNIT-II **[No. of Hours:09]**

Sorting in polynomial Time: Insertion sort, Merge sort, Quick sort, Sorting in Linear Time: Radix Sort, Bucket Sort.

UNIT-III **[No. of Hours:09]**

Greedy Technique: Fractional Knapsack Problem, Activity Selection Problem, Dynamic Programming: 0/1 Knapsack Problem, Branch-and-Bound: Assignment Problem, Traveling Salesperson Problem.

UNIT-IV **[No. of Hours:09]**

Graph: Introduction, Representation of Graph, BFS, DFS, Minimum Spanning Tree: Prims Algorithm, Kruskal Algorithm.
Single Source Shortest Paths: Bellman-Ford Algorithm, Dijkstra Algorithm, All Pair Shortest Paths: Floyd-Warshall Algorithm,

UNIT-V **[No. of Hours:04]**

NP-Completeness: P, NP, NP-Hard & NP-Complete Class.

Text Books:

TB1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI, 2nd Edition, 2006

TB2. S. Dasgupta, C. Papadimitriou and U.Vazirani, "Algorithms", McGraw Hill Higher Education, 1st Edition, 2017.

TB3. J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2nd Edition, 2009.

Reference Books:

RB1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India,

RB2. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of ComputerAlgorithms, 2nd Edition, Universities press,

RB3. Anany Levitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition,Pearson Education.

RB4. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning.

RB5. Baase: Computer Algorithms: Introduction to Design and Analysis, 2nd ed., Addis

Course Outcomes (COs):

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Remember the basic concepts and complexities for various algorithms. Demonstrate P and NP complexity classes of the Problem.
CO2	Understand the concepts of asymptotic notations to Explain the complexities of various algorithms.
CO3	Apply and solve various sorting and tree-based algorithms.
CO4	Finding efficient solutions using various algorithms for given problems.
CO5	Evaluate and checking innovative solutions for real-world problems using different paradigms.
CO6	Construct the solution for real-world problems using various problem solving techniques

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	2	3	3	2	-	-	-	-	-	-	-	-
CO3	3	2	3	2	1	-	-	-	-	-	-	-
CO4	2	2	2	3	2	1	-	-	-	2	-	-
CO5	2	3	2	2	3	2	1	-	2	1	2	2
CO6	2	2	2	1	-	-	1	1	1	1	-	-
AVG	**2.33**	**2.33**	**2.16**	**1.66**	**0.83**	**0.5**	**0.33**	**0.16**	**0.5**	**0.66**	**0.33**	**0.33**

Course code : BITGE401				
Course Name : Software Engineering				
Semester /Year: 4th Sem/ 2nd year				
	L	T	P	C
	3	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To understand the nature of software development and software life cycle.
2. Explain methods for capturing specifying, visualizing analyzing software requirement.
3. To know basic of testing and understanding concept of software quality assurance.
4. To understand the concept of software cost model.
5. To develop good quality software and able to maintain quality of software
6. To develop knowledge of tools available for software development.

COURSE CONTENTS

Unit I **[No. of Hours: 6]**

Introduction: Introduction to software engineering, Importance of software, evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.

Unit II **[No. of Hours: 8]**

Software Requirement Specification: Analysis, Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of matrices and Measurement, Problem Analysis, Requirement specification, Monitoring and Control.

Unit III **[No. of Hours: 8]**

Software-Design: Design principles, problem partitioning, top down and bottom up-design, Structured approach functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling, Functional independence, Software Architecture, Transaction and Transform Mapping, Component level Design.

Unit IV **[No. of Hours: 10]**

Coding: Top-Down and Bottom Up programming, structured programming, information hiding, programming style and internal documentation. Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification and validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.

Unit V **[No. of Hours: 8]**

Software Reliability & Quality Assurance: Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 Certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM.

Text Books:

TB1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed.Boston: McGraw Hill, 2001

TB2. Jalote, Pankaj, "Software Engineering Ed.2"New Delhi: Narosa 2002

Reference Books:

RB1. Schaum's Series, "Software Engineering" TMH

RB2. Ghezzi Carlo and Others "Fundamentals of Software Engineering" PHI

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define, label, name, Select, show, software engineering process and software process models.
CO2	Classify, compare, outline, relate, summarize requirements, types of requirements for the development of application.
CO3	Identify various system models for business processes and construct, develop the existing system.
CO4	Analyze and maintains efficient reliable software solutions by creating a blue print for further development.
CO5	Assessing and evaluate SW engineering testing and risk strategies, and develops their appropriate applications.
CO6	Build, create or develop Software engineering tools

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		3	2	3			3				
CO2		3	1						3			
CO3	2	3	2	3	3	2				3		
CO4	2			1		2				3		
CO5								3	3			
CO6	1											
AVG	1	1	1	1	1	0.8	0.0	1	1	1.0	0.0	0.0

3 – Highest Correlated, 2 – Medium Correlated, 1 – Low Correlated

Course code : BITDSC401				
Course Name : Introduction to IoT				
Semester /Year: 4th Sem/ 2nd year				
	L	**T**	**P**	**C**
	2	**0**	**0**	**2**

Course Objectives: The objectives of this course are

1. To understand the basic concept of Internet of Things (IOT), its standards and components.
2. Learn the Network and Communication protocols for IoT.
3. Identify the role of controllers and sensors in IoT.

COURSE CONTENTS

Unit I IOT concepts **[No. of Hours: 5]**

Technologies that led to the evolution of IoT, IOT and SCADA, IOT and M2M, IoT and Big data

Unit II IoT Standards and Components **[No. of Hours:5]**

IOT standards in practice, Operating platforms /systems. **IoT Components:** Design of IoT systems, Development of prototypes.

Unit III Challenges in IoT implementation. **[No. of Hours: 5]**

Big Data Management, Connectivity challenges, Mission-critical applications. Security issues in IOT

Unit IV IoT Applications (Case studies) **[No. of Hours: 5]**

Lighting as a service, Intelligent Traffic systems, Smart Parking, Smart water management etc.

Unit V Relevance of IoT for the future. **[No. of Hours: 4]**

IOT in everyday life, Internet of Everything, IOT and Individual Privacy. **IoT in Indian Scenario:** IOT and Aadhaar, IOT for health services, IOT for financial inclusion, IOT for rural empowerment.

Text Books:

TB1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.

TB2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.

TB3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.

TB4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things –

Key Applications and Protocols", Wiley, 2012.

Reference Books:

RB1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014

RB2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

RB3. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1- 4493-9357-1

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	**Detailed Statement of the CO**
CO1	Recall and list the key technologies that led to the evolution of IoT, including the concepts of SCADA, M2M, IoT, and Big Data.
CO2	Understanding of IoT standards and components, including the ability to explain the functions of various IoT platforms and operating systems.
CO3	Apply knowledge to design and develop prototype IoT systems, utilizing appropriate IoT components and platforms to address specific needs.
CO4	Analyze various challenges in IoT implementation, such as big data management, connectivity issues, mission-critical applications, and security concerns, and identify potential solutions.
CO5	Evaluate real-world IoT applications through case studies (such as Lighting as a Service, Intelligent Traffic Systems, Smart Parking, and Smart Water Management) to assess their effectiveness, efficiency, and societal impact.
CO6	Demonstrate creativity by designing an innovative IoT solution for a real-world problem, considering the relevance of IoT in everyday life, individual privacy, and specific applications in the Indian context, such as health services and rural empowerment.

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1	1	1	1	1	1	1	1	1	1
CO2	3	2	2	1	1	1	1	1	1	1	1	1
CO3	3	3	3	3	2	1	2	2	2	1	2	2
CO4	2	3	2	3	2	1	1	1	1	1	1	1
CO5	2	2	1	2	3	1	1	1	1	1	2	1
CO6	3	2	3	3	3	2	3	2	1	2	2	3
AVG	**2.7**	**2.2**	**2**	**2.2**	**2**	**1.2**	**1.5**	**1.3**	**1.2**	**1.2**	**1.5**	**1.5**

3: Highest

Course code	**:AEC4**				
Course Name	**: Communication Skill -Reading and writing skills**				
Semester/Year	**: 4th /2nd**				
	L	**T**	**P**	**C**	
	2	**0**	**0**	**2**	

L- Lecture T–Tutorial P – PracticalC –Credit

Course Objectives:

The objectives of this course are-

1. To communicate appropriately in real-life situation.
2. To use English effectively for study and communicative purpose for successful career.
3. To develop and integrate the use of four language skills- Reading and Writing in his/herwhole life.
4. To understand different types of barriers and kinds of communication.
5. Learn the skills to face interview, making a speech, presentation etc.

Course Contents:

Unit	Topics and Contents
1. Introduction: Types and modes of Communication	Barrier to Communication, Kinds of communication: intrapersonal, personal, group and mass, Verbal and non-Verbal communication.
2. Reading Skills	Skimming, Scanning, Summary, Paraphrasing, Comprehension
3. Writing Skills: Social and Official Correspondence	Complaints and replies, Letter to the editors, Standard business letter, Email drafting and etiquettes, Preparing agenda and minutes for meetings, Job application, Cover letters, Bio-data, CV and Resume

Reference Books:

1. Dangwal, Surekha. *The Art Effective Communication.* Delhi: Macmillan,2017.
2. Prasad, P. *The Functional Aspects of Communication skills*, Delhi
3. Sen, Leena. *Communication Skills*, Prentice hall of India, New Delhi.
4. McCarty, Michel. *English Vocabulary in Use*, Cambridge University Press.
5. Communication Skill by Sanjay Kumar & PushpLata, Oxford University Press
6. An Introduction to Professional English and Soft Skills by B.K. Das, CambridgeUniversity.

Course outcomes (COs):

Upon successful completion of the course a student will be able:

CO#	Detailed Statement of the CO
CO1	To memorize the functions of communication and related topics.
CO2	To improve communication skills to communicate within the society.
CO3	To implement writing and reading as skills.
CO4	To organize vocabulary and improve accuracy in grammar.
CO5	To select positive attitudes for English Communication.
CO6	To design formal letters, CV, interview, resume and cover letters etc for successful career skills.

CO-POMAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1			1	1				2	
CO2	1	3	2	2	1		1	1				
CO3	2	2	1	1		1			2		2	
CO4		2	3	1	1	3	1	1		2	1	
CO5	1	3	2	2	1		1	2			2	2
CO6	1	2	2	1	1		1	2	1	2	1	2
AVG	1.33	2.16	1.83	1.16	0.66	0.83	0.83	1	0.5	0.66	1.33	0.66

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course Code	**:CITVC 401**				
Course Name	**:Big Data Analytics**				
Semester/Year	**: 4th /2nd**				
	L	**T**	**P**	**C**	
	2	**0**	**0**	**2**	

L- Lecture T–Tutorial P – Practical C –Credit

Course Objectives: The objectives of this course are

1. Explain core Big Data concepts (3Vs), ecosystem (Hadoop, Spark), and storage systems (HDFS, NoSQL).
2. Implement data processing workflows using MapReduce, Spark, and query tools (Hive, Pig).
3. Perform descriptive, predictive, and prescriptive analytics on large datasets using statistical/ML methods.
4. Assess privacy, security, and scalability issues in Big Data solutions, including regulatory compliance (GDPR).
5. Build a complete Big Data pipeline for real-world problems.

Unit 1: Introduction to Big Data **[No. of Hours: 8]**

Overview of Big Data: Definition, characteristics (volume, velocity, variety); Big Data vs. traditional data; Applications and industry use cases.

Big Data Ecosystem and Technologies: Introduction to Hadoop, Spark, and NoSQL databases; Overview of cloud-based Big Data platforms.

Data Storage and Management: Distributed file systems (HDFS); Data lakes vs. data warehouses; Data ingestion techniques.

Unit 2: Big Data Processing and Analytics **[No. of Hours: 7]**

Data Processing Frameworks: MapReduce paradigm; Spark architecture and RDDs; Batch vs. stream processing.

Big Data Analytics Techniques: Descriptive, predictive, and prescriptive analytics; Statistical methods for Big Data; Visualization tools.

Querying and Data Retrieval: Introduction to Hive and Pig; SQL-like querying for Big Data; Real-time analytics concepts.

Unit 3: Advanced Topics and Ethical Issues **[No. of Hours: 7]**

Machine Learning in Big Data: Scalable ML algorithms; Integration with Spark MLlib; Case studies in Big Data ML.

Big Data Architecture and Workflow: End-to-end Big Data pipeline; Data integration and ETL processes; Scalability and fault tolerance.

Ethics and Challenges in Big Data: Data privacy and security; Ethical considerations in data handling; Regulatory frameworks (e.g., GDPR).

Text Books:

TB1. VK Jain, "Big Data & Hadoop", Khanna Book Publishing Co. [P] Ltd.

TB2. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.

TB3. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References Books:

RB1. Robert D. Schneider , "Hadoop for Dummies", Wiley publication
RB2. Bernard Marr, "Big Data In Practice", Wiley publication
RB3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
RB4. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall fundamental concepts of Big Data (3Vs), Hadoop ecosystem, and NoSQL databases.
CO2	Explain the differences between batch (MapReduce) and stream processing (Spark), and data storage systems (HDFS, data lakes).
CO3	Implement basic Big Data workflows (e.g., data ingestion using Flume/Kafka, querying with Hive/Pig).
CO4	Compare Big Data tools (Hadoop vs. Spark) and architectures (data lake vs. warehouse) for specific use cases.
CO5	Assess ethical and regulatory challenges (GDPR, bias) in Big Data projects and propose mitigation strategies.
CO6	Design an end-to-end Big Data pipeline using Hadoop/Spark for a real-world problem.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	2	1	2	2	1	1	1
CO2	3	2	2	2	1	2	1	2	3	1	1	1
CO3	3	3	3	3	1	2	2	3	3	2	2	2
CO4	2	3	3	3	1	2	2	2	3	2	1	2
CO5	1	2	1	1	3	1	1	1	1	2	3	2
CO6	3	3	3	3	2	3	3	3	3	3	2	3
AVG	2.5	2.3	2.2	2.2	1.5	2	1.7	2.2	2.5	1.8	1.7	1.8

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP41**			
Course Name	**: Lab-Java Programming**			
Semester /Year	**: 4th /2nd**			
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES: The objectives of this course are

- To teach the students basics of JAVA programs and its execution.
- To teach the students the differences between C++ and Java programming.
- To make the students learn concepts like packages and interfaces.
- To make the students understand threads.
- To make the students understand the usage utility package.
- To teach the student, to develop java programs using inheritance and interfaces.
- To understand exceptional handling, command line arguments and file handling

COURSE OUTCOMES

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	To remember object oriented concepts
CO2	To understand multi-threading programs
CO3	To apply Exception handling
CO4	To analyze GUI based applications
CO5	Evaluate simple java program
CO6	Design applet program

CO PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2		3						2				
CO3	1		2			2						
CO4	1	1										
CO5						2	1	2				
CO6	2	2	2	1	2	2	1	1				
AVG	1	1	0.66	0.16	0.33	1	0.33	0.83				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP42**				
Course Name	**: Lab- PYTHON PROGRAMMING**				
Semester /Year	**: 4th /2nd**				
		L	**T**	**P**	**C**
		0	**0**	**2**	**1**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Basic programming constructs and functions in python.
2. Understand the applicability of data structures like lists, tuples, sets and dictionaries inpython applications.
3. Use object-oriented programming features of python to develop applications.
4. Learn how to use exception handling in applications for error handling.
5. Database and file based programming

COURSE CONTENTS

- Working with Jupyter notebook.
- Programs based on loops and conditional statements.
- Programs based on string manipulations.
- Programs based on List.
- Programs based on tuples.
- Programs based on sets.
- Programs based on dictionary.
- Working with user defined functions.
- Working with lambda, map, filter and reduce functions.
- Programs based on recursion.
- Programs for file handling in Python.
- Programs for Sorting and searching.
- Database handling in Python using SQLite3.
- Working with in built and user defined modules,
- Working with Object Oriented Programming in Python

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Describe the program creation in Python through usage of appropriate constructs
CO2	Demonstrate the working of basic programming constructors in Python.
CO3	Apply data structure primitives like strings, lists, tuples, sets and dictionaries on various types of data with or without using functions, object-oriented concepts to the programs in Python etc.

CO4	Analyze basic constructs of Python and how constructs can be used all together.
CO5	Evaluate the programs and its logic.
CO6	Develop programs using methods of constructs define in Python.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1			3	1	2				
CO2	3	1	2	3		3	2	3				
CO3	3	2	3	3	1	2	2	3				
CO4	2	1	3	3	2	3	2	3				
CO5	3	1	3	1	2	3	2	3				
CO6	3	2	2	3	1	2	2	3	1	1		1
AVG	**2.8**	**1.3**	**2.3**	**2.2**	**1**	**2.7**	**1.8**	**2.8**	**0.2**	**0.2**		**0.2**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

FIFTH SEMESTER

Course code	**:**	**BITDSC501**			
Course Name	**:**	**C# .NET**			
Semester /Year	**:**	**5th/3rd**			
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- To study the features of .NET Technologies and to understand the framework and environment.
- To learn C# programming fundamentals for console application development.
- To learn use of C# libraries and exception handling techniques.
- To learn ADO. NET and advance features of C#.
- To learn .NET assemblies and attributes

COURSE CONTENTS

UNIT1 **[No. of Hours:09]**

Introduction to .NET Framework And **C#**.NET framework, MSIL, CLR and its components, CLS, CTS, Justin time (JIT) Compiler, Base class library, Namespaces, Assemblies, DLL -Hell Problem, Garbage Collection.

UNIT 2 **[No. of Hours:10]**

Introduction to C#, Visual studio console app, Boxing and Unboxing, loops, Array, Enumerations, structures.OOPs, Classes and objects, Encapsulation, Inheritance, Polymorphism, Constructor and Destructors, Method Overloading ,Method overriding,

UNIT3 **[No. of Hours:09]**

Modifiers, Abstract class, Sealed class, Interface, Indexers , Operator Overloading, Collections Namespaces,Delegates, Event handling , Exception Handling.

UNIT 4 **[No. of Hours:5]**

Windows Forms and Controls in details: Windows FormsProperties and Events, Windows Form Controls etc.

UNIT 5 **[No. of Hours:7]**

Ado.net, Grid, Data source and data binding controls, Connected and disconnected scenarios, Dataset, connections, Adapters, commands, data readers.

TEXT BOOKS:

TB1. A Guide to the Project Management Body of Knowledge (PMBOK), Project Management Institute,PA, (2004).
TB2. Harold Kerzner, Frank P. Saladis, Project Management Workbook and PMP/CAPM Exam Study Guide, Wiley Publishers (2006)
TB3. Addison Wesley –C# Developers Guide to ASP.Net Wiley," Beginning Visual C# 2008",Wrox

REFERENCE BOOKS:
RB1. Claudia M. Baca, Patti, PMP: Project Management Professional Workbook, Sybex, Workbook (2003). RB2. C#.Net Developers Guide- Greg Hack, Jason Werry, Saurabh Nandu. (SyngRess)

RB3. Wrox Press Professional C# 3rd Edition – Simon Robinson, Jay Glynn

COURSE OUTCOMES
After completion of the course, a student will be able to

CO	Detailed Statement of the CO
CO1	Knowledge and remember.NET Framework, its runtime environment and application development IDE of Visual Studio.
CO2	Understand the concept of object oriented for making programs.
CO3	Implement C# language constructs in the form of stand-alone console and window form applications.
CO4	Analyze and Understand database concepts in ADO.NET and apply the knowledge to implement distributed data-driven applications.
CO5	Design application using ADO.net
CO6	Create the programs based on console, windows and web application.

CO POMAPPING

CO	POI	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	3	1	1	1		1		
CO2	3	2	3	1	1	1	1	1			1	1
CO3	2	2	3	1	2	1	-	1		1	1	1
CO4	2	2	2	1	2	1	-	1				
CO5	2	2	3	1	1	2	1	1			1	
CO6	2	2	1	1	1	1	-	1	1	1		
AVG	2.16	1.33	2.5	1.66	1.16	1.16	0.5	1	0.16	.5	.5	.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BITDSC502				
Course Name : Introduction To Machine Learning				
Semester /Year: 5th /3rd				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understand the fundamental concepts of machine learning, including supervised and unsupervised learning, data preprocessing, and key mathematical foundations.
2. Apply supervised learning techniques such as linear regression, logistic regression, and regularization while evaluating models using appropriate metrics.
3. Implement unsupervised learning methods like K-means clustering and PCA, and analyze their real-world applications and challenges.
4. Explore advanced ML concepts including decision trees, neural networks, and ethical considerations in AI, while gaining an introductory understanding of reinforcement learning.

COURSE CONTENTS

Unit 1: Basics of Machine Learning **[No. of Hours: 10]**

Definition of machine learning, types of supervised and unsupervised learning, real-world applications, importance of data in ML, basics of data preprocessing, introduction to probability and statistics, overview of linear algebra for ML.

Unit 2: Supervised Learning Fundamentals **[No. of Hours: 10]**

Supervised learning, difference between regression and classification, linear regression, concept of cost function, logistic regression for classification, understanding overfitting, basics of regularization, evaluation metrics like accuracy and precision.

Unit 3: Unsupervised Learning Basics **[No. of Hours: 10]**

Unsupervised learning, clustering with K-means, basics of dimensionality reduction, Principal Component Analysis (PCA), applications of clustering and PCA, challenges in evaluating unsupervised models.

Unit 4: Introduction to Advanced ML Concepts **[No. of Hours: 10]**

Decision trees, basics of ensemble methods like random forests, introduction to neural networks, perceptrons, activation functions, overview of reinforcement learning, ethical issues in ML like bias and fairness.

Text Book:

TB1. "Understanding Machine Learning: From Theory to Algorithms" by Shai Shalev-Shwartz and Shai Ben-David
TB2. "Python Machine Learning" by Sebastian Raschka and Vahid Mirjalili
TB3. "Machine Learning for Dummies" by John Paul Mueller and Luca Massaron

Reference Books:

RB1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop
RB2. "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy
RB3. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
RB4. "Introduction to Machine Learning" by Ethem Alpaydin
RB5. "Machine Learning: The Art and Science of Algorithms that Make Sense of Data" by Peter Flach
RB6. "Applied Predictive Modeling" by Max Kuhn and Kjell Johnson

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall the definitions and key concepts related to Machine Learning and identify different types of Machine Learning algorithms and their applications.
CO2	Explain the principles and techniques of supervised and unsupervised learning and demonstrate an understanding of evaluation metrics and model selection techniques in Machine Learning.
CO3	Apply data preprocessing and cleaning techniques to prepare data for Machine Learning algorithms and implement & apply various Machine Learning algorithms to solve classification and regression problems.
CO4	Analyze the performance of Machine Learning models using evaluation metrics and interpret the results.
CO5	Critically evaluate the strengths and weaknesses of different Machine Learning algorithms for specific tasks and assess the ethical implications and considerations of using Machine Learning algorithms in real-world applications.
CO6	Design and create Machine Learning models to solve complex problems and develop innovative solutions by combining different Machine Learning techniques and algorithms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	1	1	1	1	1	1	1	1
CO2	2	2	3	2	1	2	2	2	1	1	1	2
CO3	2	2	3	2	1	2	2	2	1	1	1	2
CO4	2	1	2	1	1	2	2	2	1	1	1	1

CO5	1	1	2	2	2	2	2	2	1	1	2	2
CO6	2	2	2	3	2	3	3	3	1	1	2	3
AVG	**1.8**	**1.6**	**2.4**	**1.8**	**1.4**	**2**	**2**	**2**	**1**	**1**	**1.4**	**1.8**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSC503**				
Course Name	**: STATISTICS**				
Semester /Year	**: 5th /3rd**				
	L	**T**	**P**	**C**	
	3	**1**	**0**	**4**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- To study methods of collection, classification, tabulation of data.
- To apply various statistical methods and analyses the data
- To find correlation between the data.
- To study probability and probability distribution to solve various real life problems
- To test hypothesis using various statistical test.

COURSE CONTENTS:

UNIT 1: DATA & ITS DIAGRAMMATIC REPRESENTATION [No. of hours:10]

Definition of Statistics, Data , Primary data & secondary data, classification of data, tabulation of data , individual series, Discrete frequency Distribution ,continuous frequency distribution, Exclusive and inclusive continuous series, Diagrammatic representation of data ,Tabular form ,1D (All Bar Diagrams),Histogram, Frequency polygon, frequency curve, Ogive.

UNIT 2: MEASURE OF CENTRAL TENDANCY & DISPERSION[No. of Hours: 10]

Mean (Arithmetic Mean, Weighted Mean, Harmonic Mean, Geometric Mean), Median, Mode, Histogram &Mode, Relationship between mean, median, mode. Definition of dispersion, Range, Quartile deviation & its coefficient, Inter Quartile deviation, Mean deviation & its coefficient, Standard deviation.

UNIT 3: CORRELATION & REGRESSION ANALYSIS [No. of Hours: 10]

Correlation definition, types of correlation, Karl Pearson coefficient of correlation, Spearman coefficient ofcorrelation, repeated rank. Regression Analysis Regression lines, Regression line of Yon X & X on Y, Regression coefficient, Relationship between correlation & regression coefficient.

UNIT 4: PROBABILITY & PROBABILITY DISTRIBUTIONS [No. of Hours: 10]

Probability & probability distribution: probability, Sample space & events , types of event, conditionalprobability, Bayes theorem, Mathematical expectation

UNIT 5: SAMPLING, HYPOTHESIS TESTING & STATISTICAL TEST [No. of Hours: 10]

Sampling & its type, Probability & Non probability sampling, Hypothesis, Null hypothesis, Alternative hypothesis, Type I & Type II Errors , Statistical Test: F test ,T test, ANOVA -1

ANOVA 2, Chi square testas test of independence.

TEXT BOOKS:

TB1. Gerald Keller : Managerial Statistics 9th Edition.TB2 Statistical method , SP Gupta

REFERENCE BOOKS:

RB1. Richard Levin & David Rubin : Statistics for management, Prentice Hall.
RB2. Anderson, Sweeny & Williams: Statistics for Business and Economics, South W

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

CO	DETAILED STATEMENT OF THE CO
CO1	To gain knowledge of statistical method like Average, , Correlation Regression ,dispersion probability and probability distribution
CO2	To understand statistical method like Average, Correlation, Regression ,dispersion probability and probability distribution
CO3	To apply statistical method and probability distribution
CO4	To analyze various statistical method and probability distribution
CO5	To apply statistical method probability distribution and statistical test to test the hypothesis
CO6	To create new statistical method probability distribution and statistical test

CO-PO MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	1	2	1					
CO2	3	1		2		1	2	1				
CO3	3	2	1	1		2	1		2			
CO4	2	1	2	2	1	2	3	1		2	1	
CO5	1	2	1	3	2	2	2				1	1
CO6	1						2					1
AVG	2	1.16	1.16	1.5	0.66	1.5	1.83	0.33	0.33	0.33	0.33	0.33

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITGE504**				
Course Name	**: ENTERPRISE RESOURCE PLANNING**				
Semester /Year	**: 5th/3rd**				
	L	**T**	**P**	**C**	
	3	**1**	**0**	**4**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES: The objectives of this course are

- To learn the need and evolution of ERP Systems and related technologies.
- To learn ERP benefits and classification and implementation of ERP Life Cycle
- To learn Analytical Hierarchy Process & its applications and ERP implementation approaches and its strategies.
- To learn factors affecting ERP success and effectiveness.
- To learn extend ERP and its learning and emerging issues.

COURSE CONTENTS

Unit-I **[No. of Hours: 10]**

Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system

Unit-II **[No. of Hours: 6]**

ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product.

Unit-III **[No. of Hours: 6]**

ERP Life Cycle: Adoption Decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement phases, ERP Modules

Unit- IV **[No. of Hours: 10]**

Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in Evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendor's evaluation criterion, ERP Implementation approaches and methodology, ERP Implementation strategies, ERP Customization,

Unit- V **[No. of Hours: 8]**

Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP Implementation, Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP

Implementations.

TEXT BOOKS:

TB1. Enterprise Resource Planning, Alexis Leon

TB2. ERP Concepts & Planning, V.K. Garg & N.K. Venkita Krishnan

REFERENCE BOOKS:

RB3. ERP Ware: ERP Implementation Framework, V.K. Garg &N.K. Venkita Krishnan

COURSE OUTCOMES:

Upon successful completion of the course a student will be able to

CO	Detailed Statement of the CO
CO1	Defining basic use of enterprise software and its role in integrating business functions, reengineered business processes, phases of ERP implementation life cycle, domains of ERPs, implementation cost etc.
CO2	Understanding the work done during the ERP implementation life cycle.
CO3	Illustrate the Analytical Hierarchy Processes (AHP) for the selection of ERP system. Apply the customization to ERP system as per user's requirement.
CO4	Analyze the role of consultant, vendors and users in ERP implementation.
CO5	Evaluate critical success and failure factors for implementation, Hidden cost during ERP implementation.
CO6	Formulate methodology for the implementation of ERP system.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	1	1	1					
CO2	2	2	2	2	1	1	2	1	1	1	1	1
CO3	2	2	1	3	1		1					
CO4		1	3	1	3		1					
CO5	1	2	1	2	1		1					
CO6	2	2	2	2	1	2	2	2	1	1	1	1
AVG	1.5	1.66	1.83	2	1.33	0.66	1.33	0.5	0.33	0.33	0.33	0.33

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE505A**				
Course Name	**: Android Programming**				
Semester /Year	**: 5th/3rd**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSEOBJECTIVES:

- This course facilitates classroom and laboratory learning.
- Letting students develop competence and confidence in android programming.
- Understand the entire Android Apps Development Cycle.
- Enable the students to independently create Android Applications.
- Access and work with databases under the Android operating system.

COURSE CONTENT

UNIT 1 **[No. of Hours: 10]**

History of Android, The Open Handset Alliance, Android Core building blocks, Android Architecture, Android SDK, Creation of New AVD, DVM, Creating run configuration, Building a sample Android application.

UNIT 2 **[No. of Hours: 10]**

OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

UNIT 3 **[No. of Hours: 10]**

Anatomy of Android Application, Android terminologies, Application Context, Activities, Activity lifecycle. Services, Intents and its Types, Android Manifest File and its common settings, Using Intent Filter.

UNIT 4 **[No. of Hours: 10]**

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes), Android Toast, Event handling, Images, Designing User Interfaces with Layouts.

TEXT BOOKS:

TB1. Sayed Y Hashimi and Satya Komatineni, "Pro Android", Wiley India Pvt. Ltd.

TB2. Android application development for java programmers.By James C. Sheusi. Publisher: CengageLearning, 2013.

REFERENCE BOOKS:

RB1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education2nd edition.

RB2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt. Ltd.
RB3. Mark L Murphy, "Beginning Android", Wiley India Pvt. Ltd.

COURSE OUTCOMES

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Knowledge and remember the basics of Java and Android
CO2	Describe the life cycles of Activities, Applications etc.
CO3	Apply the major components of Android API set to make apps. Use thedevelopment tools in the Android development environment.
CO4	Classifying and finding uses of UI –components and java Constructs.
CO5	Make UI-rich apps using all the major UI components.
CO6	Create Android apps using Java programming language.

CO PO MAPPING:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	3	2	1	1	1	1		1
CO2	2	2	3	2	2	1	2	1	1	1	1	1
CO3	2	1		1		2	1	1	1	1		1
CO4	2	1	3	2	3	1		1	1	1	1	1
CO5	2	1	3	2	2		1	2		1	1	1
CO6	2	1	2				1	1	1	1		1
AVG	2	1.16	2.33	1.5	1.66	1	1	1.16	1	1	0.5	1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE505B**				
Course Name	**: Cloud Computing**				
Semester	**: 5th/3rd**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To explore Cloud Computing Basic concepts and its applications.
2. To understand Virtualization and its role in the implementation of cloud computing.
3. To Data center overview and its architecture.
4. To demonstrate popular public clouds and their features.
5. To discuss security issues in cloud and available countermeasures.

Course Contents:

Unit 1 **[No. of Hours: 8]**

Introduction to Cloud Computing: Definition, Evolution & Characteristics, Service Models of cloud computing Iaas, PaaS, SaaS and their Comparisons, Issues & Challenges of Cloud Computing, Applications of Cloud computing, Overview of Cloud Computing Security Configurations.

Cloud Computing Architecture: Introduction, Cloud Architecture, Deployment of Models – (Public, Private, Community, and Hybrid Clouds) and their comparisons, IDaaS, Over View of Data intensive computing through Map Reduce.

Unit 2 **[No. of Hours: 8]**

Virtualization in Cloud: Virtualization, Implementation of Virtualization, Middleware Support for Virtualization, Advantages & Applications of Virtualization, Virtualization Implementation Techniques, Hardware Virtualization, Types of Virtualization.

Unit 3 **[No. of Hours: 8]**

Data Centre Architecture and Technologies: Architectural Building Blocks of Data Centre, Industry Direction and Operational and Technical Phasing, Industry Direction and Overview of Operational and Technical Phasing (Overview of 5 Phases).

Unit 4 **[No. of Hours: 10]**

Computing with Titans: Google, Microsoft, Amazon, IBM, Accessing the Cloud- Platforms through a brief overview of Web Applications, Web API's, Web Browsers.

Implementation of Cloud Using Any Cloud Platform : Introduction to Web Services, Structure, Objective, Cloud Portals, Groups, Mobile Apps, Setting up of Cloud Services, Containers, Handling Cloud Shell, Setting up of projects, Building Virtual Infrastructure, Deployment of Virtual Machine, Configuring Load Balancing.

Unit 5 **[No. of Hours: 6]**

Security Issues in Cloud Computing: Introduction, Security Challenges in Cloud Computing, Information Security, Privacy and Trust in Cloud Computing.

Text Books:

TB1. V. K. Pachghare, "Cloud Computing" PHI Learning, 1st Edition, 2016.

TB2. Venkata Josyula, Malcom Orr, Greg Page, "Cloud Computing Automating the Virtualized Data Center", Cisco Press, 1st Edition, 2016.

TB3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing a Practical Approach", McGraw Hill, 1st Edition, 2015.

Reference Books:

RB1. Erl Thomas, Puttini Ricardo, Mahmood Zaigham ,"Cloud Computing - Concepts, Technology and Architecture", Pearson India, 1st Edition, 2014. Srinivas Cheemalapti Yi-an Chang, Shahir Daya, Matthieu Debeaux, Odilon

RB2. Magroski Goulart, Vasfi Gucer, Rahul Gupta, Shamim Hossain, David Kwock, Jordan T Moore, David N Nguyen, Bobby Woolf, "Hybrid Cloud Data and API Integration: Integrate Your Enterprise and Cloud with Bluemix Integration Services", IBM Redbooks, 2nd Edition, 2016.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	To understand Cloud Computing concepts, classifications, and the basic cloud architecture. Exploring various Cloud services and applications currently used in industry.
CO2	Understanding abstraction and virtualization techniques. and Security in the cloud computing environment.
CO3	Analyze the concept of Data Centre's with Cloud Computing and examine the Use cases
CO4	Exploring major Cloud service platforms currently ruling the industry.
CO5	To have knowledge on various standards used and cloud security features.
CO6	Implementation of any Cloud platform

CO-PO Mapping

After completion of the course, a student will be able to:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2		1			1		
CO2	2	3		3	3							
CO3	3		2		2		2			1		
CO4	3	3		3	2						1	1
CO5	1	1	1	1	1		1					
CO6	1	1		1	1		1			1	1	
AVG	2.16	1.66	0.66	1.66	1.83		0.83			0.5	0.33	0.16

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE505C**				
Course Name	**: Computer Graphics**				
Semester /Year	**: 5th/3rd**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES: The objective s of this course is:

- Introduces the basic concepts of computer graphics
- Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
- Use of geometric transformations on graphics objects and their application in composite form.

COURSE CONTENTS

Unit 1 **[No. of Hours: 8]**

Graphics Primitives: Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display Plotters, Printers. Input Devices: Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera. Mathematics for Computer Graphics: Point representation, Vector representation, Matrices and operations related to matrices, Vector addition and vector multiplication, Scalarproduct of two vectors, Vector product of two vectors.

Unit 2 **[No. of Hours: 8]**

Line Drawing Algorithms: DDA Algorithms, Bresenham's Line algorithm. Segment & Display files:Segments, Functions for segmenting the display file, Posting and posting a segment, segment naming schemes, Default error conditions, Free storage allocation, Display file structure.

Unit 3 **[No. of Hours: 8]**

Transformation: 2D transformation, Basic Transformations, Composite transformations: Reflection, Shearing, Transformation between coordinate systems. 3D Graphics: 3D Display Methods, 3D transformations, Parallel projection, Perspective projection, Visible lines and surfaces identification, Hidden surface removal Graphics Operations: Clipping, Point Clipping, Line Clipping, Polygon Clipping. Filling: Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm.

Unit 4 **[No. of Hours: 8]**

Conics, Curves and Surfaces: Quadric surfaces: Sphere, Ellipsoid, and Torus. Superquadrics: Superellipse, superellipsoid, Spline & Bezier Representations: Interpolation and approximation splines, parametric continuity conditions, Geometric Continuity Conditions, Spline specifications. Bezier curves and surfaces

TEXT BOOKS:

TB1. Donald Hearn and M Pauline Baker, "Computer Graphics" PHI

REFERENCE BOOKS:

RB1. Steven Harrington, "Computer Graphics: A Programming Approach" TMH
RB2. Prajapati A.K. "Computer Graphics" PPM Ed2

COURSE OUTCOMES:
Upon successful completion of the course a student will be able to

CO	Detailed Statement of the CO
CO1	Describe the working of Cathode – ray tube
CO2	Describe the representation of point, line and circle
CO3	Construct 2D and 3D Transformation
CO4	Identify parallel and perspective projection
CO5	Understand the concept of Animation
CO6	Plan line drawing program

CO PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3		3					1					
CO4			2		2							
CO5						2			1			
CO6	2	2	1		2	2	1	1	1			
AVG	1.33	0.83	0.5		0.66	0.66	0.33	0.16	0.33			

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP51**				
Course Name	**: Lab-C#.NET**				
Semester /Year	**: 5th/3rd**				
		L	**T**	**P**	**C**
		0	**0**	**2**	**1**

L - Lecture T – Tutorial P – Practical C – Credit

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES: The objectives of this course are

- To learn and understand different types of statements in C#.
- Use of data base for making dynamic websites using C# programming
- Programming concepts in .Net Framework.
- Data base connectivity using ADO.net
- Understand and use of different graphical tools for the development of web page and website using C# programming.

COURSE CONTENTS:

1. Program to generate prime numbers between 1 to200 and also print to the console. (ex. 1,2,3,5.....199).
2. Program to print ARMSTRONG number.
3. Program using loop that examines all the numbers between 2 and 1000, and displays only Perfect numbers.(A perfect number is the one whose sum of their divisors equals the number itself).For example given the number 6, the sum of its divisors is 6(1+2+3).Hence, 6 is a perfect number.
4. Program to accept an array of integers (10) and sort them in ascending order.
5. Program to implement the concept of abstract class.
6. Program to implement the concept of sealed class.
7. Program for jagged array and display its item through for each loop.
8. Program in C Sharp using a class that gets the information about employee's such as Emp Id, First Name, Last Name, Basic Salary, Grade, Address, Pin Code and Contact Number. Write a method that calculates the Gross Salary (Basic +DA+HRA) and returns to the calling program and another method for the Net salary (Gross - (P.F + Income Tax)).Finally write a method that prints, a pay slip of an employee, containg all the above components in a proper format to the console.(Grade A = 20,000 , B=15,000 and C=10,000) DA=56% and HRA=20%., Pf=780, ITax.
9. Program to demonstrate boxing and unboxing.
10. Program to find number of digit, character, and punctuation in entered string.
11. Program using C# for exception handling.
12. Program to implement multiple inheritances using interface.
13. Program in C# using a delegate to perform basic arithmetic operations like addition, subtraction, division, and multiplication.

14. Program to get the user's name from the console and print it using different namespace.
15. Demonstrate the concept of Multithreading using locks in C Sharp
16. Program to implement Indexer.
17. Program to design two interfaces that are having same name methods how we can access these methods in another class.
18. Program to implement method overloading.
19. Program to implement method overriding
20. Program in C sharp to create a calculator in windows form.
21. Create a front end interface in windows that enables a user to accept the details of an employee like EmpId ,First Name, Last Name, Gender, Contact No, Designation, Address and Pin. Create a database that stores all these details in a table. Also, the front end must have a provision to Add, Update and Delete a record of an employee.
22. Create a database named MyDb (SQL or MS Access).Connect the database with your window application to display the data in List boxes using Data Reader.
23. Program using ADO.net to insert, update, delete data in back end
24. Display the data from the table in a DataGridView control using dataset.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Remember the basics of C# programming, different graphics tools and their use.
CO2	Understand of static and dynamic web pages using standard tools and learn various properties of the tools.
CO3	Develop interactive and user friendly websites using front end and back end programming.
CO4	To develop, implement and creating Applications with ADO.NET and SQL server
CO5	Create user interactive web pages using ASP.Net.
CO6	Create console, windows and wed applications

Mapping of PO and CO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1		1	3	1	2	1	1	1	1
CO2	3	1	2	3	1	3	2	3	1	1		1
CO3	3	2	3	3	1	2	2	3	1	1	1	
CO4	2	1	3	3	2	3	2	3	1	1		1
CO5	3	1	3	1	2	3	2	3	1	1	1	
CO6	2	3	2	2	1		1	1	2	1		
AVG	2.66	1.5	2.33	2	1.33	2.33	1.66	2	1.16	1	.5	.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITSM5**			
Course Name	**: SEMINAR**			
Semester / Year	**: 5th Semester / 3rd Year**			
L	**T**	**P**	**C**	
0	**0**	**4**	**2**	

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Identify and compare technical and practical issues related to the area of course specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well-organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

COURSE OUTCOMES (COS):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recite and speak cogently with or without notes on the topic using audio-visual aids.
CO2	Utilize technical resources.
CO3	Acquire the confidence in presenting the topic.
CO4	Analyze technically relevant current topics on computer science/information technology/research.
CO5	Create audience-centered presentations.
CO6	Create technical documents and give oral presentations related to the work completed.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3							2		2		
CO2			3									2
CO3			3									2
CO4						2					3	
CO5				2							3	
CO6	2									2	2	
AVG	0.8	0.0	1.0	0.3	0.0	0.3	0.0	0.3	0.0	0.7	1.3	0.7

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

SIXTH SEMESTER

Course code : BITP61				
Course Name : Capstone Project				
Semester /Year : 6th /3rd				
	L	T	P	C
	0	0	24	12

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

In this course, the learners will be able to develop working expertise of solving complex computing problems through project based learning approach using real world case studies by implementing theconcepts studied in the theory courses of this semester.

COURSE OUTCOMES:

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify the problem and describing it.
CO2	Understand the requirements of the chosen project.
CO3	Apply the collected requirements to describe the project in a systematicand comprehensive approach.
CO4	Analyze the technical aspects of the chosen project to find the possible solutions for development of the project.
CO5	Evaluate the effective reports and documentation for all project related activitiesand solutions.
CO6	Create plan for the project development.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1						1	2		2	1
CO2	1	3		2	1	2			1			
CO3	1	1	3	2	1	1	1			2		1
CO4	1	1	1	1	1	1	2	1	1	2	2	3
CO5	2			1	3	1	2	1	2	1	3	1
CO6	2	3	3	3	1	1	1	3	1	1	1	1
AVG	1.66	1.8	1.4	1.8	1.4	1.2	1.5	1.2	1.4	1.5	2	1.4

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

SEVENTH SEMESTER:

Course code	**: BITDSC701**				
Course Name	**:Data Science Using Python**				
Semester /Year	**: 7th /4th**				
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understating the concept of Data Science
2. Using the data science using Python
3. Understanding the use of NumPy in data science and how it is different from Python List
4. To understand the dataframe, reading csv, tsv file and working on it.
5. Handling the missing value and data cleansing
6. Understanding the concept of visualize the numbers in graphs using the Python libraries Metplotlib and Seaborn

COURSE CONTENTS

Unit I **[No. of Hours: 12]**

NumPy: Introduction, NumPy Array, NumPy Array Size, NumPy Array Shape, NumPy Mathematical Functions, NumPy Trigonometric Functions, NumPy Random, NumPy String Operations

Unit II **[No. of Hours: 12]**

Pandas: Pandas Series, Pandas DataFrame, Pandas Read_csv, Pandas Write csv File, Data Cleansing, Pandas Handling Missing Values, Pandas concat(), Pandas join(), Pandas append(), Pandas GroupBy

Unit III **[No. of Hours: 10]**

Metplotlib: Matplotlib Line Plot, Matplotlib Histogram, Matplotlib Bar Chart, Matplotlib Pie Chart, Matplotlib Scatter Plot, Matplotlib Subplot, Matplotlib Save Figure, Matplotlib Image Show

Unit IV **[No. of Hours: 6]**

Seaborn: Introduction, Seaborn Line Plot, Seaborn Histogram, Seaborn Barplot

Text Books

TB3. Pandas for everyone, Python Data Analysis by Daniel Y. Chen, Pearson publication
TB4. Laura Igual, Santi Seguí, "Introduction to Data Science - A Python Approach to Concepts,

Reference book:

RB3. Techniques and Applications", Springer
RB4. Wes McKinney, "Python for Data Analysis", O'Reilly

RB5. Luca Massaron, John Paul Mueller, "Python for Data Science for Dummies"

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Defining the fundamental of data science and libraries used.
CO2	Understanding the scientific computing in Python, data analysis and plotting.
CO3	Applying data science functions on data
CO4	Analyzing data through plots.
CO5	Evaluate the output produced by the different data science constructs.
CO6	Designing programs based on data science concepts.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1		1						
CO2	2	1	2	2		1		1				
CO3	2	2	2	2		1	2	3		1		
CO4	1	3	2	2			1	3				
CO5	1	3	3	2								
CO6	2	3	3	3		1	2	3	1	1		
AVG	**1.7**	**2.2**	**2.2**	**2**		**0.7**	**0.8**	**1.7**	**0.2**	**0.3**		

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BITDSE702A				
Course Name : Research Methodology				
Semester /Year : 7th /4th				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

Course Objectives: The objectives of this course are

- Understand the research process and its significance in computer applications.
- Familiarize students with various research methods and designs.
- Develop skills to design research studies and formulate research questions.
- Gain proficiency in data collection, analysis, and interpretation.
- Enhance critical evaluation and interpretation of research literature.
- Develop effective research reporting and presentation skills.
- Foster ethical conduct and responsible research practices.
- Stimulate creativity in proposing innovative research directions.

Course Contents

Unit 1: Introduction to Research Methodology **[No. of Hours: 5]**
Definition and scope of research, Importance of research in computer applications, Research ethics and responsible conduct of research, Types of research (basic, applied, experimental, etc.), Components of a research study

Unit 2: Research Design and Planning **[No. of Hours: 8]**
Research problem identification and formulation, Research objectives and research questions/hypotheses, Variables and operationalization, Types of research design (exploratory, descriptive, experimental, etc.), Sampling techniques and sample size determination

Unit 3: Data Collection Methods **[No. of Hours: 8]**
Primary and secondary data, Quantitative data collection methods (surveys, experiments, observation), Qualitative data collection methods (interviews, focus groups, case studies), Questionnaire design and survey construction, Data sources and data validity and reliability

Unit 4: Data Analysis and Interpretation **[No. of Hours: 8]**
Quantitative data analysis techniques (descriptive statistics, inferential statistics), Qualitative data analysis techniques (content analysis, thematic analysis), Statistical software tools (SPSS, R, Excel), interpreting research findings and drawing conclusions

Unit 5: Research Reporting and Presentation **[No. of Hours: 6]**
Structure and components of a research report, Writing research proposals and abstracts, Formatting guidelines (APA, IEEE, etc.), Presenting research findings effectively (oral presentations, posters)

Unit 6: Critical Evaluation of Research Literature **[No. of Hours: 5]**
Reviewing and synthesizing research articles, Evaluating research quality and validity, Identifying research gaps and proposing future research directions, Academic integrity and avoiding plagiarism.

Text Books:

TB1: Bagchi, Kanak Kanti (2007) Research Methodology in Social Sciences: A Practical Guide, Delhi, Abijeet Publications.

TB2: Kothari, C.R (2004) Research Methodology: An Introduction, Delhi, New Age.

Reference Books:

RB1: Cooper, R. Donald and Pamela S. Schindler (2003) Business Research Methods, Delhi, Tata McGraw-Hill.

RB2: Flyvbjerg, Bent (2001) Making Social Science Matter: Why Social Inquiry Fails and How it can Succeed Again, United Kingdom, Cambridge University Press.

RB3: Goodde and Hatte (1952) Methods in Social Research, New York, McGraw – Hill.

Course Outcome (COs):

Upon successful completion of the course a student will be able to:

CO#	Detailed Statement of the CO
CO1	Recall the key concepts and terminology related to research methodology. Identify and describe the steps involved in the research process. Memorize ethical guidelines and principles for conducting research.
CO2	Explain the importance of research in the field of computer applications. Demonstrate an understanding of different research designs and their suitability for specific research objectives. Interpret research literature and identify the main findings and implications.
CO3	Apply appropriate research methods and techniques to collect and analyze data in the context of computer science. Design research studies and formulate research questions or hypotheses. Utilize statistical software tools to analyze quantitative research data.
CO4	Analyze research data and draw meaningful conclusions based on statistical analysis. Evaluate the validity and reliability of research findings. Critically assess the strengths and weaknesses of research methodologies used in published studies.
CO5	Evaluate the quality and credibility of research sources. Assess the ethical implications of research studies. Critique research methodologies and propose improvements or alternative approaches.
CO6	Design and develop research proposals, including clear research objectives, methodologies, and expected outcomes. Produce well-structured and properly formatted research reports or papers. Generate new research ideas and propose innovative research directions in the field of computer applications.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	1	1	2	1	1	1	1	1	1
CO2	2	2	2	2	2	2	2	2	1	2	2	2
CO3	1	1	2	2	2	2	2	1	1	1	1	2
CO4	1	1	2	2	2	2	2	1	1	1	1	2
CO5	1	1	1	2	2	2	2	1	1	1	1	2
CO6	1	1	2	2	2	2	2	1	1	1	1	2
AVG	1.4	1.6	1.8	2	2	2.2	2	1.4	1.2	1.4	1.4	2

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE702B**				
Course Name	**: SOFTWARE PROJECT MANAGEMENT**				
Semester / Year	**: 7th Semester / 4th Year**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

- Understand the fundamental concepts and principles of software project management.
- Gain knowledge of project initiation, planning, and estimation techniques.
- Develop skills in project organization, team management, and effective communication.
- Apply project execution and monitoring methodologies, such as Waterfall and Agile.
- Analyze project risks and implement strategies for risk mitigation.
- Demonstrate the ability to create project charters, scope statements, and schedules.

COURSE CONTENTS

Unit 1: Introduction to Software Project Management **[No. of Hours: 3]**
Definition and importance of SPM, Characteristics of software projects, Role of project management in software development

Unit 2: Project Initiation **[No. of Hours: 5]**
Feasibility analysis, Project selection and justification, Project charter and scope statement

Unit 3: Project Planning **[No. of Hours: 12]**
Work breakdown structure (WBS), Project scheduling techniques (Gantt charts, PERT/CPM), Resource allocation and leveling, Risk identification and management

Unit 4: Project Estimation **[No. of Hours: 5]**
Estimation techniques (expert judgment, analogy, parametric), Function point analysis, COCOMO model

Unit 5: Project Organization and Team Management **[No. of Hours: 6]**
Project roles and responsibilities, Team building and team dynamics, Communication and collaboration in project teams, Project Execution and Monitoring

Unit 6: Project Execution and Monitoring **[No. of Hours: 9]**

Project execution methodologies (Waterfall, Agile, etc.), Tracking project progress, Change management, Earned value management

Text Books:

TB1: "Software Project Management: A Process-Driven Approach" by Ashfaque Ahmed
TB2: "Quality Software Project Management", Robert T. Futrell, Donald F. Shafer, and Linda I.. Shafer, 2002, Pearson Education Asia.
TB3: "Managing Global Software Projects", Ramesh Gopalaswamy, 2003, Tata McGraw-Hill

Reference Books:

RB1: "Software Project Management: A Unified Framework" by Walker Royce
RB2: "A Guide to the Project Management Body of Knowledge (PMBOK® Guide)" by Project Management Institute (PMI)
RB3: "Project Management: A Systems Approach to Planning, Scheduling, and Controlling" by Harold Kerzner
RB4: "Managing the Software Process" by Watts S. Humphrey

Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall the key concepts and principles of software project management. Identify the characteristics of software projects and their role in software development.
CO2	Explain the importance of project initiation and its components. Understand different project planning techniques and their application in software projects.
CO3	Apply project estimation techniques to determine resource requirements and project schedules. Apply risk management strategies to identify and mitigate potential risks in software projects.
CO4	Analyze the impact of changes in project requirements and effectively manage change requests. Analyze project progress using earned value management techniques and make informed decisions.
CO5	Evaluate the effectiveness of project communication and collaboration strategies. Evaluate the feasibility of software projects using appropriate analysis techniques.
CO6	Develop a comprehensive project charter and scope statement for a given software project. Create a project schedule using Gantt charts or PERT/CPM techniques for effective project planning.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	1	3	1	1	2	1	2	2
CO2	2	2	2	2	2	3	2	2	1	1	2	2
CO3	1	2	2	2	2	3	2	2	2	1	2	2
CO4	1	2	2	2	2	3	2	2	2	1	2	2
CO5	1	2	2	2	2	3	2	2	2	1	2	2
CO6	2	2	2	2	2	3	2	2	3	1	2	2
AVG	1.4	2	2	1.8	1.8	3	1.8	1.8	2	1	2	2

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE703A**				
Course Name	**: Network Security and Cryptography**				
Semester /Year	**: 8th / 4th**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Understand the basic Knowledge of Network Security Concepts &the Challenges and Scope of InformationSecurity
- Understand the basic Concept of Block Cipher &the Importance of Cryptographic Algorithms and their Uses.
- Learn and Understand Encryption Techniques & Access Control Mechanism Used for User Authenticationand Authorization.
- Understand the concept of authentication of message in network by using different techniques.
- Aware and Learn the Usages of Sockets Layer (SSL), Secure Internet Protocol (IP) and HTTPS

COURSE CONTENTS:

UNIT 1: Introduction To security **[No. of Hours: 7]**

Basic aspects of Network security, Attacks active & passive attacks, Types of attack, VIRUS and itscategories, Conventional Encryption, Conventional Encryption Model, Substitution & transposition techniques, Bit level encryption and operations.

UNIT 2 : Introduction Block Cipher Differential & Linear Cryptanalysis

[No. of Hours: 5]

Block Cipher Design Principles, Block Cipher Modes of Operations, , steganography, Differential & LinearCryptanalysis

UNIT 3:Conventional Encryption Algorithms **[No. of Hours: 9]**

DES,DES Algorithm, DES strength ,2DES, 3 DES, Men in Middle attack, DES standard, AES, Blowfish, International Data Encryption Algorithm IDEA, RC-5, CAST-128, RSA, Key Distribution, Deffie HellmenKey Exchange Algorithm, Random Number Generation.

UNIT 4: Message Authentication & Hash Functions **[No. of Hours: 10]**

Authentication Requirements, Authentication Functions, Message Authentication Codes MAC,HMAC, Hash Function, Birthday Attacks, Message Digest Algorithm: MD5 & SHA, Digital Signature, Digital Signature Standard (DDS), Proof of Digital Signature Algorithm, Digital certificate. , X.509, X.25, Secure Electronic Transaction, Authentication Protocol, Authentication Applications: Kerberos.

UNIT 5: Email, Internet Security **[No. of Hours: 6]**

Secure Socket Layer, Directory Authentication Service, Electronic Mail Security, PEM, Pretty Good Privacy (PGP), IP security, S/MIME Security: Architecture, Authentication

Header, Encapsulating Security Payloads, cyber laws

TEXT BOOKS:

TB1. Atul Kahate, "Cryptography and Network Security" TMH

REFERENCE BOOKS:

RB1. William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice hall, NewJersey

RB2. Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag

COURSE OUTCOMES:

After completion of the course, a student will be able to

CO#	DESCRIPTION
CO1	Able to understand & remember basics of cryptography &security like active and passive attacks and encryption and decryption techniques
CO2	Able to understand and apply the concept of linear and differential crypt Analysis
CO3	Able to understand & remember basics of conventional encryption techniques like DES, Blowfish etc.
CO4	Able to understand basics of message authentication like digital signature , Authentication protocol like Kerberos etc.
CO5	Able to understand & remember the concept of SSL SET
CO6	To design and compose Email security, Authentication Header, & Encapsulating Payload etc.

CO-POMAPPING:

CO	POI	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12
CO1	2	1			1	1						
CO2	1	2	1	2	1							
CO3	2	2		2	1	1		1				
CO4	1	2	2	1		2	1					
CO5		2	1	2	1	2		1				
CO6	1	2	1	2	1	2						

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE703B**				
Course Name	**: Data Analysis with R**				
Semester /Year	**: 7th Semester / 4th year**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

The objective of this course is to develop a broad perspective about the R programming and its applications to solve basic mathematical problems, statistical manipulations and scientific tasks such as data science and machine learning. R programming has its own built in functions to perform any specialized task. The course is intended to learn the basics of R software in this course.

COURSE CONTENTS:

UNIT 1 **[No. of Hours: 8]**

What is R?, What is S? Basic Features of R, Limitations of R, R Framework setup, R packages, Use R like calculator, Reading and Writing data into R: combine or concatenate command, scan command, alternative commands for reading data, R constant and variables, operators and expression.

UNIT 2 **[No. of Hours: 8]**

R data types and objects: Number and Text, Vector, Matrix, Factor, Array, List Data Frame, Manipulating Objects. Control structures, looping, scoping rules, Operations on Dates and Times, functions, debugging tools. R built-in packages and functions.

UNIT 3 **[No. of Hours: 8]**

Dataset: Import/export bigger datafile (csv, text, excel, table, url, etc.), Identify and handle missing values, data formatting, Data Standardization, Data Normalization and Scaling, Data visualization, Binning, Multimedia datasets: text dataset, image dataset, audio dataset, video dataset.

UNIT 4 **[No. of Hours: 8]**

Central tendency, Dispersion variance, standard deviation, shape skewness, kurtosis, percentiles, five-point summary, boxplots, histograms, bar plot, pie chart, scatter plot, two-way tables, covariance, correlation, Chi Square test for two-way tables.

UNIT 5 **[No. of Hours: 8]**

Introduction to machine learning, types of machine Learning, supervised learning using R- regression, decision tree, KNN, SVM, Unsupervised learning using R- Clustering: K-means, hierarchical, frequent itemset, dimensionality reduction.

TEXTBOOK(S)

1. R programming for data science. R. D. Peng, Leanpub, 2016.
2. Practical Data Science with R. Author(s): Nina Zumel, John Mount, Manning Shelter Island, 2014.

REFERENCES :

1. The R book, Crawley and Michael, John Wiley & Sons, 2012.
2. Beginning R: The statistical programming language. Mark Gardener, John Wiley & Sons, 2012.

COURSE OUTCOMES:

After completion of the course, a student will be able to

CO#	DESCRIPTION
CO1	Apply the basic functionalities of R programming to solve basic mathematical problems
CO2	Apply the R programming for preprocessing the real-life datasets.
CO3	Understand and analyze the descriptive statistics for a given dataset.
CO4	Implement some classical machine learning models using R programming.
CO5	Evaluate the output produced by the different data science constructs.
CO6	Design and create Machine Learning models to solve complex problems using R

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	1	2	1	2	2	2	2
CO2	2	2	3	2	2	2	3	2	3	2	2	3
CO3	2	2	3	2	2	2	3	2	3	2	2	3
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	3	3	3	3	3	3	3	3	3	3	3	3
CO6	3	3	3	3	3	3	3	3	3	3	3	3
AVG	2.3	2.3	2.5	2.1	2.3	2.1	2.5	2.1	2.5	2.3	2.3	2.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**:**	**BITDSE704A**			
Course Name	**:**	**Optimization Technique in Machine Learning**			
Semester /Year	**:**	**7th Semester / 4th Year**			
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Understand the role of optimization in machine learning algorithms.
- Learn various optimization techniques including gradient-based and evolutionary methods.
- Apply optimization methods to real-world ML problems.
- Analyze convergence and performance of optimization algorithms.

COURSE CONTENTS:

Unit 1: Introduction to Optimization

- Definition and scope of optimization in ML
- Types of optimization problems: linear, nonlinear, convex, non-convex
- Mathematical preliminaries: calculus, linear algebra
- Cost functions and loss functions in ML

Unit 2: Convex Optimization

- Convex sets and functions
- Gradient descent and variants
- Convergence analysis
- Applications in regression and classification

Unit 3: Stochastic Optimization

- Stochastic Gradient Descent (SGD)
- Mini-batch and online learning
- Momentum, RMSProp, Adam
- Optimization in deep learning

Unit 4: Advanced Techniques

- Newton's method and quasi-Newton methods
- Constrained optimization: Lagrange multipliers, KKT conditions
- Duality and regularization
- Optimization for support vector machines (SVM)

Unit 5: Metaheuristic and Practical Applications

- Genetic algorithms, Particle Swarm Optimization
- Hyperparameter tuning
- Optimization in neural network training

TEXTBOOK(S)

- *Convex Optimization* by Stephen Boyd and Lieven Vandenberghe
- *Optimization for Machine Learning* by Suvrit Sra, Sebastian Nowozin, and Stephen Wright
- *First-Order Methods in Optimization* by Amir Beck
- *Linear Algebra and Learning from Data* by Gilbert Strang
- *Foundations of Data Science* by Avrim Blum and Ravi Kannan
- **COURSE OUTCOMES:**
- *After completion of the course, a student will be able to*

CO#	DESCRIPTION
CO1	Understand the mathematical Foundation of optimization in ML
CO2	Apply Gradient-Based methods to solve ML problems
CO3	Implement Stochastic Optimization algorithms for large –scale data
CO4	Analyze and compare optimization techniques for different mL models
CO5	Use Metaheuristic approaches for hyper parameter tuning and model selection
CO6	Design and create Machine Learning models to solve complex problems

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	2	2	3	1	1	1	2	2	2
CO2	2	2	3	2	2	3	1	1	1	2	2	2
CO3	2	2	3	2	2	3	1	1	1	2	2	2
CO4	2	2	3	2	2	3	1	1	1	2	2	2
CO5	1	2	3	2	2	3	1	1	1	1	2	2
CO6	2	2	3	2	2	3	1	1	1	2	2	2
AVG	**2**	**2.2**	**3**	**2.2**	**2.2**	**3**	**1.4**	**1.4**	**1.4**	**2**	**2.2**	**2.2**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BITDSE704B				
Course Name :Advance RDBMS				
Semester /Year : 7th /4th				
	L	T	P	C
	3	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

- Understand the concepts and principles of transaction processing in RDBMS.
- Learn the techniques for ensuring recoverability and handling transaction failures.
- Gain knowledge of concurrency control techniques and their application in managing concurrent transactions.
- Explore the fundamentals of distributed DBMS, including data fragmentation, replication, and allocation.
- Introduce the basics of Object-Oriented DBMS (OODBMS).
- Develop critical thinking and analysis skills in evaluating and designing advanced RDBMS solutions.
- Apply acquired knowledge to real-world scenarios through practical projects and case studies.

COURSE CONTENTS

UNIT I **[No. of Hours: 12]**

Transaction Processing Concepts: Transaction system, testing of serializability, Serializability of Schedules Conflict & view serializable schedule

UNIT II **[No. of Hours: 6]**

Recoverability, Recovery from transaction failures, log based recovery, Checkpoints, deadlock handling

UNIT III **[No. of Hours: 12]**

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version Schemes, Recovery with concurrent transaction.

UNIT IV **[No. of Hours: 8]**

Distributed DBMS Concepts and design: Introduction, functions and architecture of a DDBMS, transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database,

UNIT V **[No. of Hours: 2]**

Introduction to OODBMS.

Text Books:

Adv. DBMS by V.K. Jain, Cyber Tech Publication, 5A/13 Ansari Road, Daryagang, N.Delhi.-110002

Date C.J. "An Introduction to Database System". Addision Wesley

References Books:

Korth, Silbertz, Sudarshan, "Database Concepts" McGraw Hill

Elmasri, Navathe, "Fundamentals of Database Systems" Addision Wesley

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Recall the fundamental concepts of transaction processing in RDBMS. Identify the different types of serializability schedules. Memorize the techniques for recovery, concurrency control in transaction processing Recall the concept of distributed & object-oriented DBMS
CO2	Understand the concept of transaction in database and significance of serializability in transaction execution. Explain the principles and importance of recoverability and recovery in RDBMS. Comprehend the concurrency control techniques used in RDBMS. Understand the architecture and functions of a Distributed DBMS.
CO3	Apply transaction processing concepts to analyze and evaluate the serializability of given schedules. Utilize recovery techniques, such as log-based recovery and checkpoints, to ensure data consistency in case of transaction failures. Implement concurrency control techniques, including locking and timestamping protocols, to manage concurrent transactions effectively.
CO4	Apply and comparing the locking techniques for controlling concurrent transaction execution. Evaluate different data fragmentation and replication techniques in a distributed database system.
CO5	Evaluate distributed DBMS and OODBMS concepts. Assess the effectiveness of different concurrency control techniques in maintaining data consistency and ensuring transaction integrity. Evaluate the advantages and limitations of distributed database management systems. Critically analyze the applicability of various recovery strategies in different scenarios.
CO6	Case studies based on serializability and locking protocols.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	3	1	1	1	1	2	2	2
CO2	2	3	3	2	3	1	1	1	1	2	2	2
CO3	2	3	3	3	3	1	1	1	1	2	2	2
CO4	2	3	3	2	3	1	1	1	1	2	2	2
CO5	2	3	3	2	3	1	1	1	1	2	2	2
CO6	2	3	3	2	3	1	1	1	1	2	2	2
AVG	**2**	**3**	**3**	**2.4**	**3**	**1.2**	**1.2**	**1.2**	**1.2**	**2.4**	**2.4**	**2.4**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITP71**			
Course Name	**: LAB –Data Science Using Python**			
Semester	**: 7th Semester / 4th Year**			
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Using the data science using Python
2. Understanding the use of NumPy in data science
3. To understand the dataframe, reading csv, tsv file and working on it.
4. Handling the missing value and data cleansing
5. Understanding the concept of visualize the numbers in graphs using the Python libraries Metplotlib and Seaborn

COURSE CONTENTS

- Programs based using NumPy.
- Programs based on using series and dataframe using Pandas.
- Reading CSV files in Panadas
- Handling missing values in Panadas
- Using concat(), join(), append() and groupby in Panadas
- Plotting line plot, histogram, bar chart, pie chart, scatter plot, subplot etc. using Matplotlib and saving the figure.
- Plotting line plot, histogram, bar plot, scatter plot, heatmap, etc. using Seaborn

Course Outcomes (COs):

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Design algorithms involving more complex data structures, and can implement it.
CO2	Understanding the performance of multiple methods and models, recognize the connections between how the data were collected and the scope of conclusions from the resulting analysis
CO3	Apply models and use different measures of model to assess outputs.
CO4	Analyse the data model applied using the data science tools.
CO5	Evaluate the data from disparate sources, cleaning the data and transform data from one format to another
CO6	Developing the program using various tools of data science.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1		1						
CO2	2	1	2	2		1		1				
CO3	2	2	2	2		1	2	3		1		
CO4	1	3	2	2			1	3				
CO5	1	3	3	2								
CO6	2	3	3	3		1	2	3	1	1		
AVG	**1.7**	**2.2**	**2.2**	**2**		**0.7**	**0.8**	**1.7**	**0.2**	**0.3**		

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BITPR705A/BITPR705B				
Course Name : Dissertation on Research /Academic Based Project				
Semester / Year : 8th Semester/ 4th Year				
L	**T**	**P**	**C**	
0	**0**	**12**	**6**	

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

In this course, the learners will be able to develop working expertise of solving complex computing problems through project-based learning approach using real world case studies by implementing the concepts studied in the theory courses of this semester.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify the problem and describing it.
CO2	Understand the requirements of the chosen project.
CO3	Apply the collected requirements to define the describe the project in a systematic and comprehensive approach.
CO4	Analyze the technical aspects of the chosen project to find the possible solutions for development of the project.
CO5	Evaluate the effective reports and documentation for all project related activities and solutions.
CO6	Create plan for the project development.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1						1	2		2	1
CO2	1	3		2	1	2			1			
CO3	1	1	3	2	1	1	1			2		1
CO4	1	1	1	1	1	1	2	1	1	2	2	3
CO5	2			1	3	1	2	1	2	1	3	1
CO6	2	3	3	3	1	1	1	3	1	1	1	1
AVG	**1.7**	**1.8**	**2.3**	**1.8**	**1.4**	**1.2**	**1.5**	**1.5**	**1.4**	**1.5**	**2.0**	**1.4**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Eight Semester:

Course code :	**BITDSC801**			
Course Name :	**Machine Learning Using Python**			
Semester /Year	**: 8th Semester / 4th Year**			
L	**T**	**P**	**C**	
3	**0**	**0**	**3**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

1. Develop proficiency in Python programming, key libraries (NumPy, Pandas, scikit-learn), and data preprocessing techniques.
2. Build, train, and evaluate supervised (regression, classification) and unsupervised (clustering, PCA) models using real-world datasets.
3. Apply hyperparameter tuning, cross-validation, and model deployment (Flask) to create scalable ML solutions.
4. Interpret model performance using visualizations (Matplotlib/Seaborn) and present findings effectively.
5. Design end-to-end ML projects (e.g., customer segmentation, sentiment analysis) while considering ethical and technical constraints.

COURSE CONTENTS:

Unit 1: Python for Machine Learning **[No. of Hours: 8]**

Basics of Python programming, data types, loops, functions, key libraries including NumPy, Pandas, Matplotlib for data manipulation and visualization, setting up the environment, installing Anaconda, Jupyter Notebook, required packages, data preprocessing, handling missing data, normalization, encoding categorical variables, project on loading and exploring a dataset using Pandas and Matplotlib.

Unit 2: Implementing Supervised Learning **[No. of Hours: 8]**

Introduction to scikit-learn API, pipeline, linear regression implementation, training, visualization of results, logistic regression for building a binary classifier, evaluating performance, model evaluation using scikit-learn for accuracy, confusion matrix, ROC curves, project on predicting house prices using regression on a real-world dataset.

Unit 3: Unsupervised Learning with Python **[No. of Hours: 8]**

Clustering with scikit-learn, implementing K-means, hierarchical clustering, dimensionality reduction, applying PCA, t-SNE for data visualization, data visualization using Seaborn, Matplotlib for clustering results, preprocessing pipelines, combining preprocessing and modeling in scikit-learn, project on customer segmentation using clustering on a retail dataset.

Unit 4: Advanced Machine Learning Models **[No. of Hours: 8]**

Decision trees, random forests implementation, hyperparameter tuning, gradient boosting using XGBoost or LightGBM, introduction to neural networks, building a simple neural network with TensorFlow/Keras, model persistence, saving and loading models using joblib or pickle, project on classifying text data (e.g., sentiment analysis) using ensemble methods.

Unit 5: Model Optimization and Deployment **[No. of Hours: 8]**

Hyperparameter tuning, GridSearchCV, RandomizedSearchCV in scikit-learn, cross-validation, implementing k-fold cross-validation in Python, feature selection using scikit-learn's feature selection tools, model deployment basics, introduction to Flask for serving ML models, project on building and deploying a simple ML web application using Flask.

Text Book:

TB1. "Understanding Machine Learning: From Theory to Algorithms" by Shai Shalev-Shwartz and Shai Ben-David

TB2. "Python Machine Learning" by Sebastian Raschka and Vahid Mirjalili

TB3. "Machine Learning for Dummies" by John Paul Mueller and Luca Massaron

Reference Books:

RB1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop

RB2. "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy

RB3. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

RB4. "Introduction to Machine Learning" by Ethem Alpaydin

RB5. "Machine Learning: The Art and Science of Algorithms that Make Sense of Data" by Peter Flach

RB6. "Applied Predictive Modeling" by Max Kuhn and Kjell Johnson

Course Outcomes (OCs)

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall fundamental concepts of Python, key ML algorithms, and libraries (NumPy, Pandas, scikit-learn).
CO2	Explain the working principles of supervised/unsupervised learning models (e.g., linear regression, k-means clustering) and evaluation metrics (accuracy, ROC curves).
CO3	Implement ML pipelines (data preprocessing, model training, evaluation) using Python libraries for real-world datasets.
CO4	Compare and contrast different ML models (e.g., decision trees vs. random forests) and interpret results using visualization tools (Matplotlib, Seaborn).
CO5	Assess model performance using cross-validation, hyperparameter tuning (GridSearchCV), and justify algorithmic choices based on metrics.
CO6	Design and deploy an end-to-end ML application by integrating preprocessing, modeling, and optimization techniques.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	-	2	1	1	1	2	-	-
CO2	3	2	2	2	-	2	1	2	1	2	-	-
CO3	2	3	3	3	-	3	2	3	2	3	1	1
CO4	2	3	3	3	1	2	2	3	1	2	1	1
CO5	1	3	3	3	2	2	2	3	1	2	2	2
CO6	1	3	3	3	3	3	3	3	2	3	3	3
AVG	**2**	**2.5**	**2.5**	**2.5**	**1.5**	**2.3**	**1.8**	**2.5**	**1.3**	**2.3**	**1.4**	**1.4**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE802A**				
Course Name	**: RESEARCH PUBLICATION ETHICS**				
Semester / Year	**: 8th Semester / 4th Year**				
		L	T	P	C
		3	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:
The objectives of this course are

- Understand the research publication process and its significance in computer science.
- Develop skills in academic writing, including research paper structure and citation styles.
- Recognize and avoid plagiarism while ensuring integrity in research.
- Gain knowledge of intellectual property rights, copyright, and patents in research publications.
- Explore ethical considerations in research, including human participant involvement and data handling.
- Understand the social implications of research and practice responsible conduct.
- Familiarize with databases, indexing databases, and research metrics for evaluating research impact.
- Learn about ethical guidelines and professional organizations in the field.
- Prepare for a successful research career by building a research profile and networking.

COURSE CONTENTS

Unit 1: Introduction to Research Publication **[No. of Hours: 3]**
Importance of research publication in computer science, Different types of research publications (conference papers, journal articles, etc.), Overview of the research publication process

Unit 2: Academic Writing and Paper Structure **[No. of Hours: 6]**
Elements of a research paper (title, abstract, introduction, methodology, results, conclusion), Literature review and referencing, Writing clear and concise research papers, Formatting guidelines and citation styles (e.g., APA, MLA)

Unit 3: Plagiarism and Intellectual Property **[No. of Hours: 5]**
Understanding plagiarism and its consequences, Techniques to avoid plagiarism (paraphrasing, citing sources, etc.), Intellectual property rights and copyright, Patents and their role in protecting research innovations

Unit 4: Responsible Authorship and Collaboration **[No. of Hours: 5]**
Guidelines for responsible authorship and contributor ship, Collaboration in research and authorship order, Handling authorship disputes and conflicts of interest, Acknowledgments

and funding disclosure

Unit 5: Research Ethics **[No. of Hours: 5]**

Ethical considerations in research involving human participants, Informed consent and ethical review boards, Ethical handling of data and privacy issues, Research misconduct and ethical violations

Unit 6: Social Implications of Research **[No. of Hours: 4]**

Impact of research on society and technological advancements, Responsible conduct of research in the context of social implications, Ethical considerations in emerging areas (e.g., artificial intelligence, data science, cybersecurity), Ethical considerations in publishing controversial research

Unit 7: Ethical Guidelines and Professional Organizations **[No. of Hours: 4]**

Overview of ethical guidelines and codes of conduct (e.g., ACM Code of Ethics), Introduction to professional organizations and their role in promoting ethical research practices, Ethical responsibilities of researchers and professionals in computer science, Research Publication and Career Development

Unit 8: Importance of research publications in academic and professional careers **[No. of Hours: 4]**

Strategies for successful publication and dissemination of research, Evaluating the quality and impact of research publications, Building a research profile and networking in the research community

Unit 9: Databases and Research Metrics **[No. of Hours: 4]**

Databases, indexing databases, Citation databases: Web of Science, Scopus, etc., Research Metrics, Impact factor of journal as per journal Citation report, SNP, SJR, IPP, Cite score, Metrics: h-index, g index, i10 index, altmetrics.

Text Books:

TB1: "Research and Publication Ethics" by Wakil Kumar Yadav
TB2: "Handbook of Research and Publication Ethics" edited by Nimit Chowdhary and Sarah Hussain
TB3: "Good Practices and Ethics in Research and Publication" by Dr. Partha Pratim Ray
TB4: "Research and Publications Ethics" by Dr. S.B. Kishor, Dr. Ajay S. Kushwaha, and Dr. Gitanjali J

Reference Books:

RB1: "How to Write a Better Thesis" by David Evans, Paul Gruba, and Justin Zobel
RB2: "Publish and Flourish: Become a Prolific Scholar" by Tara Gray

Course Outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall the importance of research publication in the field of computer science. Memorize the elements and structure of a research paper. Identify different types of research publications.
CO2	Explain the ethical considerations involved in research, such as plagiarism, data

	integrity, and conflicts of interest. Understand the process of responsible authorship and collaboration in research. Comprehend the social implications of research and the responsible conduct of research in various contexts.
CO3	Apply proper citation styles and formatting guidelines in academic writing. Demonstrate the ability to avoid plagiarism and appropriately use referencing techniques. Apply ethical principles in research design and data handling.
CO4	Analyze the social and ethical implications of research in computer science. Evaluate the credibility and reliability of research publications. Analyze authorship order and resolve authorship disputes in research collaboration.
CO5	Assess the quality and impact of research publications using research metrics and indicators. Evaluate ethical issues and considerations in controversial research areas. Critically evaluate the ethical conduct of researchers in relation to research participants and data handling.
CO6	Create well-structured research papers adhering to academic writing standards. Design and propose research projects that follow ethical guidelines and address social implications. Develop strategies to build a research profile and network in the research community.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	1	1	1	2	2	2	2
CO2	2	3	3	2	3	2	2	2	3	2	3	3
CO3	2	3	3	2	3	2	2	2	3	2	3	3
CO4	1	2	2	1	2	1	1	1	2	1	2	2
CO5	2	2	2	2	2	2	2	2	2	2	2	2
CO6	2	2	2	2	2	2	2	2	2	2	2	2
AVG	1.8	2.4	2.4	1.8	2.4	1.8	1.8	1.8	2.4	1.8	2.4	2.4

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE802B**				
Course Name	**: Data and Visual Analytics in AI**				
Semester / Year	**: 8th Semester / 4th Year**				
	L	**T**	**P**	**C**	
	3	**1**	**0**	**4**	

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

- Understand the fundamentals of data analytics and visualization in AI.
- Learn tools and techniques for data preprocessing, analysis, and visual storytelling.
- Apply visualization methods to interpret AI model outputs.
- Explore real-world applications of visual analytics in decision-making.

COURSE CONTENTS

Unit 1: Foundations of Data Analytics

- Introduction to data analytics and AI integration
- Types of data: structured, unstructured, temporal, spatial
- Data collection, cleaning, and preprocessing
- Exploratory data analysis (EDA)

Unit 2: Data Visualization Principles

- Importance of visualization in AI
- Visual encoding and perception
- Types of charts: bar, line, scatter, heatmaps, boxplots
- Dashboard design and storytelling with data

Unit 3: Tools and Technologies

- Python libraries: Matplotlib, Seaborn, Plotly
- Tableau and Power BI basics
- Data visualization in Jupyter Notebooks
- Integration with AI models (e.g., TensorFlow, Scikit-learn)

Unit 4: Visual Analytics in AI Applications

- Visualizing classification and regression outputs
- Confusion matrix, ROC curves, feature importance
- NLP visualization: word clouds, embeddings
- Time-series and anomaly detection visualization

Text Books:

- *Data Visualization: A Practical Introduction* by Kieran Healy
- *Storytelling with Data* by Cole Nussbaumer Knaflic
- *Python Data Science Handbook* by Jake VanderPlas
- *Fundamentals of Data Visualization* by Claus O. Wilke
- *Visual Analytics for Data Scientists* by Arvind Satyanarayan (online resources)

Course Outcomes (OCs)

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Understand the role of data Visualization in AI decision-making
CO2	Apply visualization techniques to explore and interpret datasets
CO3	Use Modern tools to build interactive dashboards and visual reports
CO4	Analyze AI model output visual analytics
CO5	Evaluate ethical implications of visual representation in AI system
CO6	Design and deploy AI application

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	2	2	2	1	1	3	1	2	2
CO2	1	2	2	2	2	2	1	1	1	1	2	2
CO3	2	2	3	2	2	3	1	1	3	1	2	2
CO4	2	2	3	2	2	3	1	1	3	1	2	2
CO5	2	2	3	2	2	3	1	1	3	1	2	2
CO6	3	3	3	3	3	3	1	1	3	1	2	3
AVG	2	2.2	2.8	2.4	2.4	2.8	1.4	1.4	2.8	1.4	2.2	2.4

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE803A**			
Course Name	**: Generative AI**			
Semester /Year	**: 8th Semester / 4th Year**			
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives

- Introduce foundational concepts of generative modeling in AI.
- Explore architectures like GANs, VAEs, and Transformers.
- Apply generative models to text, image, and audio synthesis.
- Understand ethical implications and real-world applications.

COURSE CONTENTS

Unit 1: Fundamentals of Generative Modeling

- Generative vs. discriminative models
- Deep neural networks: MLP, CNN
- Autoencoders and Variational Autoencoders (VAEs)
- Latent space exploration

Unit 2: Generative Adversarial Networks (GANs)

- GAN architecture and training dynamics
- Deep Convolutional GANs (DCGANs)
- Wasserstein GANs and Conditional GANs
- Applications in image generation

Unit 3: Sequence Modeling and Transformers

- Recurrent Neural Networks (RNNs) and LSTMs
- Transformer architecture and attention mechanisms
- Text generation with GPT-like models
- Diffusion models and energy-based models

Unit 4: Applications of Generative AI

- Text-to-image synthesis
- Music and video generation
- AI in creative industries
- Case studies in healthcare, finance, and education

Unit 5: Ethics, Deployment

- Bias and fairness in generative models
- Deepfakes and misinformation
- Deployment using TensorFlow/PyTorch

Course Outcomes (COs)

CO Code	Description
CO1	Understand core principles of generative modeling
CO2	Implement GANs, VAEs, and Transformer-based models
CO3	Apply generative AI to real-world multimedia tasks
CO4	Analyze ethical concerns and societal impact of generative AI
CO5	Build and deploy generative AI applications using modern frameworks
CO6	Design and develop application

Textbooks

- *Generative Deep Learning* by David Foster
- *Generative AI with Python and TensorFlow 2* by Joseph Babcock & Raghav Bali
- *Deep Learning* by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
- *Transformers for Natural Language Processing* by Denis Rothman
- *Hands-On GANs* by Jakub Langr and Vladimir Bok

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	2	1	1	1	1	1	1
CO2	2	3	2	2	1	2	1	1	1	1	2	1
CO3	2	2	3	3	1	3	2	2	3	2	1	2
CO4	1	2	2	3	3	1	1	1	2	1	1	1
CO5	1	3	2	2	2	2	3	3	1	2	2	2
CO6	1	1	3	2	1	1	2	1	1	1	3	2
AVG	**1.67**	**2**	**2.17**	**2.17**	**1.5**	**1.83**	**1.67**	**1.5**	**1.5**	**1.33**	**1.67**	**1.33**

- 3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCADSE803B**				
Course Name	**: Deep Learning**				
Semester / Year	**: 8th Semester / 4th Year**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

1. Introduce fundamental concepts of deep learning, including neural networks, activation functions, and optimization techniques.
2. Develop practical skills to design, implement, and train feedforward, convolutional (CNN), and recurrent (RNN) neural networks.
3. Analyze and compare different deep learning architectures for tasks like image classification, NLP, and sequential data modeling.
4. Evaluate model performance using appropriate metrics and techniques, including hyperparameter tuning and regularization.
5. Apply deep learning to real-world problems through hands-on projects, emphasizing ethical considerations and deployment challenges.

COURSE CONTENTS:

Unit 1: Foundations of Deep Learning **[No. of Hours: 8]**
Introduction to deep learning, neural network basics (neurons, layers, weights, biases), activation functions (sigmoid, ReLU), loss functions and gradient descent, deep learning frameworks (TensorFlow, PyTorch).

Unit 2: Building and Training Neural Networks **[No. of Hours: 8]**
Feedforward neural networks and forward propagation, backpropagation, regularization (dropout, L2), hyperparameter tuning (learning rate, batch size).

Unit 3: Convolutional Neural Networks (CNNs) **[No. of Hours: 8]**
CNN basics (convolutional and pooling layers), filters, strides, padding, CNN architectures (LeNet, AlexNet), image classification applications, hands-on: CNN for image classification (e.g., MNIST).

Unit 4: Recurrent Neural Networks (RNNs) **[No. of Hours: 8]**
RNNs for sequential data, LSTM and GRU, time-series and NLP applications, word embeddings (word2vec), RNN/LSTM for text or time-series data.

Unit 5: Advanced Topics **[No. of Hours: 8]**
Generative models (GANs, VAEs), transfer learning, applications (healthcare, autonomous vehicles), model deployment basics.

Text Book:

TB1. Deep Learning: A Practical Approach by Dr. Rajiv Chopra, Khanna Publishing House
TB2. Deep Learning: An Essential Guide to Deep Learning for Beginners by Herbert Jones
TB3. Deep Learning & Applications by Dr.A.Dennis Ananth, Dr.S.Markkandeyan, Dr.M.Rajakumaran, Dr. B.Lakshmi, Quill Tech Publications
TB4. Deep Learning By Example by Ahmed Menshawy by Packt

Reference Books:

RB1. Neural Networks and Deep Learning by Charu C. Aggarwal, Springer
RB2. Deep Learning By Example by, Ahmed Menshawy, Packt
RB3. Deep learning Fundamentals and Applications for Beginners by Dr. A. GOPI KANNAN, SIP

Course Outcomes (OCs)

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall key concepts of neural networks, activation functions, and loss functions.
CO2	Explain the working of backpropagation, regularization techniques, and hyperparameter tuning.
CO3	Implement feedforward networks, CNNs, and RNNs using frameworks like TensorFlow/PyTorch.
CO4	Compare architectures like LeNet, AlexNet, and LSTMs for specific tasks (e.g., image/text data).
CO5	Assess model performance using metrics (accuracy, F1-score) and justify design choices (e.g., dropout rates).
CO6	Design a deep learning solution for a real-world problem (e.g., medical image segmentation or sentiment analysis).

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	2	1	1	1	2	1	1
CO2	3	2	2	2	1	2	1	1	1	2	1	1
CO3	3	3	3	3	1	3	2	2	2	3	2	2
CO4	3	2	2	3	1	2	2	2	1	2	2	2
CO5	2	3	3	3	2	2	2	3	1	2	2	2
CO6	3	3	3	3	3	3	3	3	1	3	3	3
AVG	2.8	2.3	2.3	2.5	1.5	2.3	1.8	2	1.2	2.3	1.8	1.8

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITDSE803C**				
Course Name	**: Introduction To BlockChain**				
Semester / Year	**: 8th Semester / 4th Year**				
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

In this course, the learners will be able to develop expertise related to the following: -

1. To provide Knowledge and concept of cryptography and blockchain.
2. To make familiar with Bitcoin and cryptocurrency with its various impact on blockchain.
3. To know about the Ethereum technology with its multiple aspects.
4. To provide an understanding about and Smart Contracts.
5. To develop an understanding about the various applications of Blockchain.

Course Content

Unit-I **[No. of Hours 10]**

Distributed systems, Blockchain, Generic elements of a blockchain, Benefits and limitations of blockchain, Tiers of blockchain technology, Features of a blockchain, Types of blockchain, Consensus,

Unit-II **[No. of Hours 10]**

Decentralization: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations,

Unit-III **[No. of Hours 10]**

Cryptography: Symmetric Cryptography, Confidentiality, Integrity, Authentication, Non-repudiation, Public Key Cryptography: Asymmetric cryptography, Public and private keys, Hash functions

Unit-IV **[No. of Hours 10]**

Introduction to Bitcoin and Ethereum

Text Books:

TB1. Imran Bashir, Mastering Blockchain, Packt, 2018

Reference Books

RB1. Daniel Drescher, Block chain basics A non-technical introduction in 25 steps, Apress , 2017.

RB2. Paul Vigna and Michael J.Casey. The Age of Cryptocurrency, 2015.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	*Recall* fundamental blockchain concepts, types, and consensus mechanisms.
CO2	*Explain* decentralization, smart contracts, and cryptographic principles in blockchain.
CO3	*Demonstrate* the use of wallets, transactions, and basic smart contracts in Bitcoin/Ethereum.
CO4	*Compare* consensus algorithms (PoW vs. PoS) and evaluate their trade-offs.
CO5	*Assess* real-world blockchain applications for security, scalability, and ethical implications.
CO6	*Design* a simple decentralized application or token using smart contracts.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	2	1	2	1	1	1	1
CO2	3	2	2	2	2	2	1	2	2	2	1	1
CO3	3	2	3	3	1	3	2	3	2	2	2	2
CO4	2	3	3	3	2	2	2	2	1	2	2	2
CO5	1	3	2	3	3	2	2	2	1	2	3	3
CO6	2	3	3	3	2	3	3	3	2	3	3	3
AVG	2.3	2.3	2.3	2.5	1.8	2.3	1.8	2.3	1.5	2	2	2

Course code : BITP81				
Course Name : Advanced Machine Learning Lab				
Semester /Year : 8th /4th				
	L	T	P	C
	0	0	2	1

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

1. Develop proficiency in Python programming, key libraries (NumPy, Pandas, scikit-learn), and data preprocessing techniques.
2. Build, train, and evaluate supervised (regression, classification) and unsupervised (clustering, PCA) models using real-world datasets.
3. Apply hyperparameter tuning, cross-validation, and model deployment (Flask) to create scalable ML solutions.
4. Interpret model performance using visualizations (Matplotlib/Seaborn) and present findings effectively.
5. Design end-to-end ML projects (e.g., customer segmentation, sentiment analysis) while considering ethical and technical constraints.

Course Outcomes (OCs)

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall syntax of Python ML libraries (NumPy, Pandas, scikit-learn) and steps in standard ML workflows.
CO2	Explain the purpose of data preprocessing techniques (normalization, encoding) and model evaluation metrics (accuracy, F1-score).
CO3	Implement supervised (linear regression, decision trees) and unsupervised (k-means, PCA) algorithms on given datasets using Python.
CO4	Diagnose model performance issues (overfitting/underfitting) by interpreting learning curves and confusion matrices.
CO5	Compare multiple ML models using cross-validation and justify optimal hyperparameters through GridSearchCV/RandomizedSearchCV.
CO6	Develop and demonstrate a complete ML pipeline (from data cleaning to deployment) for a real-world problem using Flask/Streamlit.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	-	2	-	1	1	2	-	-
CO2	3	2	2	2	1	2	1	2	1	2	-	-
CO3	2	3	3	3	1	3	2	3	2	3	1	1
CO4	2	3	3	3	2	2	2	3	1	2	2	1
CO5	1	3	3	3	2	2	2	3	1	2	2	2
CO6	1	3	3	3	3	3	3	3	2	3	3	3
AVG	2	2.5	2.5	2.5	1.8	2.3	1.7	2.5	1.3	2.3	1.6	1.4

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BITPR805A/BITPR805B**			
Course Name	**: Dissertation on Research project/Academic Based Project**			
Semester / Year	**: 8th Semester/ 4th Year**			
L	**T**	**P**	**C**	
0	**0**	**12**	**6**	

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

In this course, the learners will be able to develop working expertise of solving complex computing problems through project-based learning approach using real world case studies by implementing the concepts studied in the theory courses of this semester.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify the problem and describing it.
CO2	Understand the requirements of the chosen project.
CO3	Apply the collected requirements to define the describe the project in a systematic and comprehensive approach.
CO4	Analyze the technical aspects of the chosen project to find the possible solutions for development of the project.
CO5	Evaluate the effective reports and documentation for all project related activities and solutions.
CO6	Create plan for the project development.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1						1	2		2	1
CO2	1	3		2	1	2			1			
CO3	1	1	3	2	1	1	1			2		1
CO4	1	1	1	1	1	1	2	1	1	2	2	3
CO5	2			1	3	1	2	1	2	1	3	1
CO6	2	3	3	3	1	1	1	3	1	1	1	1
AVG	**1.7**	**1.8**	**2.3**	**1.8**	**1.4**	**1.2**	**1.5**	**1.5**	**1.4**	**1.5**	**2.0**	**1.4**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Eight Semester
B.Sc. IT(Honors with Research)

Course code	**: BITRP82**				
Course Name	**: RESEARCH PROJECT**				
Semester / Year	**: 8th Semester / 4th Year**				
	L	**T**	**P**	**C**	
	0	**0**	**36**	**18**	

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

In this course, the learners will be able to develop working expertise of solving complex computing problems through project-based learning approach using real world case studies by implementing the concepts studied in the theory courses of this semester.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify the problem and describing it.
CO2	Understand the requirements of the chosen project.
CO3	Apply the collected requirements to define the describe the project in a systematic and comprehensive approach.
CO4	Analyze the technical aspects of the chosen project to find the possible solutions for development of the project.
CO5	Evaluate the effective reports and documentation for all project related activities and solutions.
CO6	Create plan for the project development.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	1	1	2	1	1	1	1	1
CO2	2	3	2	2	1	1	3	1	1	1	1	1
CO3	2	3	3	3	1	1	3	1	2	1	1	2
CO4	3	3	3	3	1	2	2	1	2	2	1	2
CO5	1	2	2	2	3	1	3	1	3	1	2	2
CO6	1	2	2	2	1	1	3	2	1	1	1	3
AVG	**1.8**	**2.8**	**2.3**	**2.3**	**1.3**	**1.2**	**2.7**	**1.2**	**1.7**	**1.2**	**1.2**	**1.7**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated