



PONDICHERRY UNIVERSITY, PONDICHERRY

(A Central University)

SCHOOL OF MANAGEMENT

DEPARTMENT OF BANKING TECHNOLOGY

2024 – 2025 (Onwards)

Curriculum & Syllabus

**Five Year Integrated B.Tech - M.B.A (CSBS) with specialization in Banking
Technology / Financial Technology**



**PONDICHERRY UNIVERSITY
SCHOOL OF MANAGEMENT
DEPARTMENT OF BANKING TECHNOLOGY**

The Pondicherry University (A Central University) was established by an Act of Parliament, which was enforced by a Notification of the Government of India in October 1985. The campus is spread over 800 acres of land which is rolling down to the Bay of Bengal. The inner landscape is featured by sprawling lawns, well nurtured gardens, picturesque road shapes, and lush green belt with eco-forest mostly flavored by Cashew-nuts. The tranquil setting makes Pondicherry University Campus a unique one with exquisite natural beauty with seashore that captures viewers' imagination and provides an ideal atmosphere for persuading study and research. On the University Campus, 15 Schools and 37 Departments with students across the states. The university spread across campuses in Karaikkal, Mahe, Yanam and Port Blair. The University is a member of the Association of Commonwealth Universities and signed MoU with several Universities/ Institutions from India and foreign.

School of Management

The School of Management is one of the oldest School to be established in the University in the year 1986. Presently the school offers different MBA programs such as MBA (Banking Technology), MBA (Financial Technology), MBA (International Business), MBA (Logistics and Supply Chain Management), MBA (General), MBA (Data Analytics), MBA (Tourism Studies), and MBA (Insurance Management) across different campuses.

Department of Banking Technology

The Department of Banking Technology was established in the academic year 2005-06 to offer a specialized M.B.A. programme in Banking Technology under UGC's Innovative/Interdisciplinary scheme during 10th plan. Later in the year 2009-10, started its inter-disciplinary Doctoral programmes in the area of Management and Computer Science & Engineering. Sensing the emergence of FinTech in the Banking and Finance Sector, a specialized M.B.A. programme in Financial Technology was introduced from the academic year 2020-21.

Courses offered by the Department

- ❖ MBA Banking Technology
- ❖ MBA Financial Technology
- ❖ Ph.D. in Management (Banking Technology-Interdisciplinary), and
- ❖ Ph.D. in Computer Science and Engineering (Banking Technology-Interdisciplinary)
- ❖ Five Year Integrated B.Tech-M.B.A (CSBS) with specialization in Banking Technology / Financial Technology

Five Year Integrated B.Tech-M.B.A (CSBS) with specialization in Banking Technology / Financial Technology is a unique multidisciplinary programme designed to impart knowledge on emerging technologies and business skills as per the Business 4.0 with hands-on exposure to prepare the students industry-ready. Specialists in this subject area are in demand all over the world because their applied skills can revolutionize businesses and organizations of all kinds.

This programme is aimed at:

- ❖ The National Education Policy (NEP) 2020 is based programme covering the five pillars of NEP such as access, equity, quality, affordability, and accountability which helps the students for critical thinking and engage themselves in life-long learning by following innovations in business, science and technology.
- ❖ Providing essential knowledge on fundamentals of basic sciences, mathematics, Computer Science, and Business systems for the applications relevant to various streams of Engineering and Technology.
- ❖ Providing the necessary competencies for applying knowledge of computer science and business analytics tools to store, retrieve, implement, and analyze data in the context of business enterprises to diagnose business problems, explore entrepreneurial opportunities, and prepare them to manage business efficiently.
- ❖ Imparting managerial knowledge and skill sets required to manage modern business enterprises.
- ❖ Developing skills in the Technologies used in the modern industry namely Agile Technology, Artificial Intelligence, Machine learning, Blockchain Technology, Business Intelligence, Data Analytics, Information Security, Cloud Computing, IT Infrastructure Management, Information System Audit, etc.
- ❖ Inculcating the skills in emerging business technology management used in the Business 4.0 industry namely Banking Operations, Risk Management, International Banking Operations, Banking Technology, Stock Market Operations, Commodity Market, Capital Flows, and Derivative Instruments, Foreign Currency Markets and Emerging trends in Banking & Finance Sector.
- ❖ Multidisciplinary in nature by blending both technology and management to experience learning by doing with industry interface.

Major Highlights of the Curriculum

1. NEP 2020 Compliance with multiple entry and exit options in bringing out the unique capabilities of each student.
2. Academic Bank of Credits: ABC
3. Adapted industrial competency-based curriculum
4. Highly qualified, dedicated and well experienced faculty members who are blend of knowledge in Technology and Management
5. Internships and Placement in Public/Private Sector, IT and ITES industries
6. Case Study on Fortune 500 Companies
7. Soft skill Training by Professionals
8. Access to the Corporate Databases like Bloomberg, etc.,

Duration of the Programme:

Five Year-Full Time Integrated Programme (Subject to revision as per the AICTE-NEP guidelines).

Eligibility for Admission:

Passed 10+2 examination with minimum of 50% and Mathematics / Business Mathematics as one of the subject.

Course Intake: Total of 60 Students

The students have the option to exit in the 4th Year with BTech in Computer Science and Business Systems. If they would like to continue then, after 4th year, Students will be drawn for MBA-BT and MBA-FT, 30 students each programme, based on CGPA.

Admission Procedure:

Admission is based on the score secured by the candidates in the Central University Entrance Test (CUET Integrated PG)/ any other test approved by the University. Candidates need to submit the application for the programme through online. The selection will be made by the University as per the norms.

Lateral Entry:

B.Tech. Lateral Entry Programme is a continuation of technical expertise acquired after completing Diploma/Certification programmes and offers an opportunity to Diploma holders to obtain B.Tech Degree in Engineering.

10% of the sanctioned seats in each B.Tech course is allotted for lateral entry admission during the commencement of the third, fifth, seventh and ninth semesters. This is in addition to the total seats allotted for this course.

Eligibility for Lateral Entry (Minimum of 50% in the qualifying exam):

Third Semester: Certification course with minimum of 45 Credits.

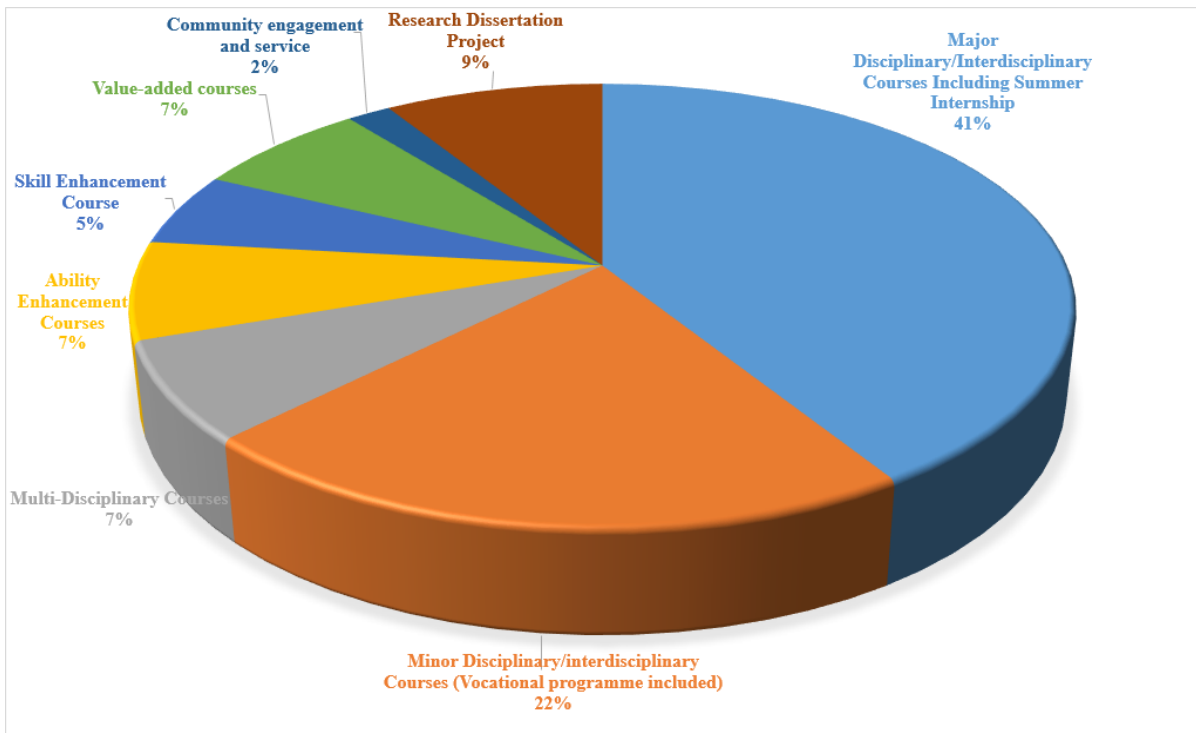
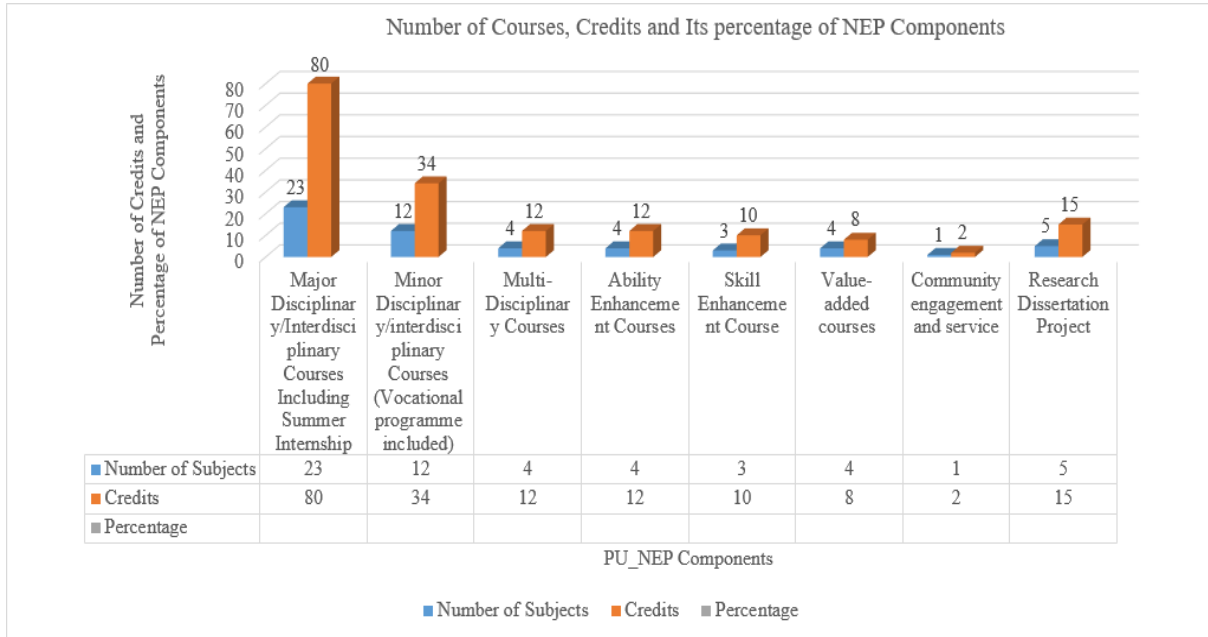
Fifth Semester: Diploma course with minimum of 91 credits.

Seventh Semester: Degree/Advanced Diploma course with minimum of 139 Credits

Ninth Semester: B.Tech Degree in Computer Science and Business Systems

NEP Components:

The Degree programme is designed as a NEP complaint programme as per the existing university guidelines applicable for UGC four-year integrated programmes. Hence, courses are offered under different components such as Major and Minor Inter/Multi-Disciplinary, Value-added, Skill and Ability Enhancement Courses. The students will undertake summer internship, research dissertation projects and community engagement and service.



Examinations:

The theory and practical examinations shall comprise continuous internal assessment throughout the semester in all subjects as well as university examinations conducted by Pondicherry University at the end of the semester (November / December or April /May).

Evaluation Scheme:

All Credit courses are evaluated for 100 marks comprising of Internal assessment and end- semester exam.

For Theory Course, the weightage of internal assessment is 40% and end semester examination is 60%

For Practical course, the weightage of internal assessment is 60% and end semester examination is 40%

For Project, the weightage of internal assessment is 60% and end semester examination is 40%

Internal Assessment (Theory)

Total Internal Assessment mark for a theory course is 40 marks. The breakup is as follows:

Criteria	Maximum Marks
a) Category I. Theory courses: Questions from all units of syllabus Category II. Theory cum Practical courses: i. Theory component: Examination shall be conducted for 30 marks and reduced to 25 marks. ii. Practical Component: 5 Questions of 2 Marks each (10 Marks) Based on Lab experiment, the examination shall be conducted for 10 marks and reduced to 5 marks. Total Marks: 30 (Theory: 25 Marks + Practical: 05 Marks)	30
b) Percentage of Attendance	5
c) Assignment(s)	5
Total	40

Marks for Attendance are as follows:

Below 75%	0
75% - 80%	1
81% - 85%	2
86% - 90%	3
91% - 95%	4
96% - 100%	5

Internal Assessment (Practical's)

Course teacher of Lab courses shall evaluate the practical course for 60 marks. The break up is as follows:

Criteria	Maximum Marks
a) Laboratory exercises and Record	30
c) Mid Semester exam (Average of 2 exams)	15
c) Internal Viva voce	5
d) Percentage of Attendance	10
Total	60

Marks for Attendance is as follows:

Below 75%	0
75% - 80%	2
81% - 85%	4
86% - 90%	6
91% - 95%	8
96% - 100%	10

Internal Assessment (Project)

The Project work carried out in the eighth semester shall be assessed as follows:

Criteria	Marks
a) Continuous assessment (Guide)	25
b) Project Evaluation Committee	35
Total	60

End Semester Exam Evaluation Pattern

<u>Course</u>	<u>Maximum marks</u>
a) Category I: <u>Theory course</u> (Sec A, Sec B and Sec C) Questions from all units of syllabus Category II. <u>Theory cum Practical courses</u> i. Theory component: Examination shall be conducted for 60 Marks and reduced to 40 Marks. ii. Practical Component: Based on Lab experiment result/Observation/Record//Viva-voce exam/Practical exams. The examination shall be conducted for 40 Marks and reduced to 20 Marks. Total Marks: 60 (Theory: 40 Marks + Practical: 20 Marks)	60 marks
b) <u>Practical course</u> (Based on Lab exercises/Record/ Practical /Viva)	40 marks
c) <u>Internship /Project Work</u> (Based on Seminar/Project Work/Project report/Presentation and viva voce)	40 marks

Attendance:

Each student shall obtain 70 per cent attendance to be eligible to appear for the End-Semester Examination.

Requirement for appearing for University Examination

The Head of the Department schedules the End- Semester exams for all theory and practical courses based on the University academic calendar. A detailed Exam Time Table shall be circulated to all students

at least 15 days before the start of exams. Question Papers shall be set Subject experts based on BOS approved syllabus.

A candidate shall be permitted to appear for university examinations at the end of any semester only if:

- i) He / She secures not less than 70% overall attendance arrived at by taking into account the total number of periods in all subjects put together offered by the institution for the semester under consideration.

(Candidates who secure overall attendance greater than 60% and less than 70% have to pay a condonation fee as prescribed by University along with a medical certificate obtained from a medical officer not below the rank of Assistant Director)

- ii) He / She earns a progress certificate from the Head of the institution for having satisfactorily completed the course of study in all the subjects pertaining to that semester
- iii) His / Her conduct is found to be satisfactory as certified by the Head of the institution. A candidate who has satisfied the requirement (i) to (iii) shall be deemed to have satisfied the course requirements for the semester.

Consolidation of Marks and Passing Minimum

A student shall be declared to have passed the examination in a subject of study only if he/she secures not less than **40% marks individually both in internal assessment and end- semester examination or an aggregate of 40%.**

A candidate who has been declared “Fail” in a particular subject may reappear for that subject during the subsequent semesters and secure pass marks. However, there is a provision for revaluation of failed or passed subjects provided he/she fulfills the following norms for revaluation.

- a) Applications for revaluation should be filed within 15 days from the date of declaration of results or 7days from the date of receipt of grade sheet whichever is earlier.
- b) The candidate should have attended all the internal assessments conducted by the department as well as all the end semester examinations conducted by the University.
- c) If a candidate has failed in more than two papers in the end semester examinations, his/her representation for revaluation will not be considered.
- d) The request for revaluation must be made in the prescribed format duly recommended by the Head of the Department along with the revaluation fee prescribed by the University.

A student shall be declared to have passed the examination in a subject of study only **if he/she secures not less than 40% marks in the end-semester examination and secures an overall aggregate of 40%.**

Grading:

Grading of the marks obtained by the students shall be made as per the regulations of NEP guidelines of the Pondicherry University.

Weightage of Marks:

Weightage of marks for both internal and end semester will be as per the NEP guideline issued by the University/AICTE for theory and practical courses.

Question Paper Pattern:

The question paper pattern for each of the subjects for End-Semester Written Examination (**For 100 Marks**) shall be with PART A - Consist of 10 short answer questions each carrying two (02) marks (Two questions should be asked from each unit) (**10*2=20 marks**), PART B Five questions are to be answered each carrying six (06) marks (**5*6=30 marks**) and PART- C with five questions in either or pattern each carrying ten (10) marks (**5*10=50 marks**)

Suitable amendments will be made based on AICTE-NEP guidelines.

For Summer Internship / Projects / Seminar etc.

Evaluation is based on quality of work done, report presentation, performance in viva-voce examination.

Award of Degree:

Title of the Programme:

Title at the end of 5th year: Five Year Integrated B.Tech-M.B.A (CSBS) with specialization in Banking Technology / Financial Technology

Title at the end of 4th year: B.Tech. (Computer Science and Business Systems)

Title at the end of 3rd year: Advanced Diploma Computer Science and Business Systems

Title at the end of 2nd year: Diploma in Computer Science and Business Systems

Title at the end of 1st year: Certificate in Computer Science and Business Systems

Strength of the Department

It is an Innovative and Interdisciplinary department and offers subjects relevant to current industrial needs. The Department has 13 highly qualified, dedicated and well experienced faculty members who are blend of knowledge in management and technology. The faculty members play a pivotal role as mentors and counsel the students towards enriching them to enhance and excel with good combination of technology and management skills.

Infrastructure Facilities

The Department has a well-equipped smart classroom facility with Wifi, air-conditioning facility, and a computer laboratory with the necessary software and hardware to cater to the learning process of students. The library is renowned for its modern infrastructure with 80,000 sq.ft fully air-conditioned, WIFI enabled, services for the Visually Challenged among the proactive services with RFID technology and 24/7 remote access to a collection of 5.91 lakhs, of which print is 2.51 and 3.40 lakhs of e-resources like e-books, e-journals, e-databases, e-theses, etc.,



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SCHOOL OF MANAGEMENT

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Curriculum 2024-2025 (Onwards) for Five Year Integrated B.Tech-M.B.A (CSBS)

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- ❖ Graduates will procure technical and managerial skills for solving contemporary business problems.
- ❖ Graduates will design and develop innovative decision-making systems to solve business problems by applying engineering principles and business strategies
- ❖ Equip graduates with the capability to design, implement and test computational approaches to develop solutions for business problems
- ❖ Improving independent learning skills can aid in successfully pursuing higher studies and engaging in innovative research.
- ❖ Inculcate professional ethics and work with commitment for the progress of society.

PROGRAMME OUTCOMES (POs)

- ❖ **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- ❖ **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- ❖ **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- ❖ **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- ❖ **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- ❖ **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- ❖ **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- ❖ **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- ❖ **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- ❖ **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- ❖ **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- ❖ **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

- ❖ The ability to develop and innovate quality software products for changing business needs requires comprehending the problem and applying various programming and managerial skills.
- ❖ The ability to design interdisciplinary software interfaces along with database management to meet the needs of the BFSI industry.
- ❖ The ability to demonstrate personal, organisational and entrepreneurship skills through critical thinking and engage themselves in life-long learning by following innovations in business, science and technology.



PONDICHERRY UNIVERSITY, PONDICHERRY
(A Central University)
GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

B. Range of Credits: In the light of the fact that a typical Model Four-year Undergraduate degree programme in Engineering has about 163 credits, the total number of credits proposed for the four-year B. Tech in Computer Science and Business System is kept as 193. For two-year post graduate degree programme in MBA the minimum credit requirement is 100. So for the five-year Integrated B.Tech., MBA (CSBS) programme an overlapping of 56 credits in UG and 45 credits for one-year PG is proposed and the total credits for the five-year degree is kept as 238.

C. Structure of Integrated PG Program in Computer Science and Business System (CSBS) and MBA: The structure of UG programme in Computer Science and Business System (CSBS) with MBA shall have essentially the following categories of courses with the breakup of credits as given:

S.No	Category	Credit Breakup for CSBS	Credit Breakup for MBA
1	Humanities and Social Sciences including Management courses	19	-
2	Basic Science courses	23	-
3	Engineering Science courses including Workshop, Drawing, Basics of Electronics/Electrical/Mechanical/ Computer etc.	31	-
4	Professional Core courses	79	37
5	Professional Elective courses relevant to chosen Specialization/ Branch	12	-
6	Open Electives from other Technical and /or Emerging subjects	9	-
7	Project work, Seminar and Internship in Industry or elsewhere	18	18
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)	-
9	Community Engagement/ Audit Courses	2	-
	Total	193	45
Total Credits for Integrated B.Tech., MBA		238	

D. Course code and Definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
C	Credits
AE	Ability Enhancement
MA	Major Courses
MI	Minor Courses
MD	Multi-Disciplinary Courses
SE	Skill Enhancement Courses
VA	Value-added Courses

➤ Category-wise Courses for AICTE**HUMANITIES & SOCIAL SCIENCES COURSES [CSHS]**

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 115	Design Thinking	I	0	0	2	1
2.	ENAE 111	English-I	I	2	0	2	3
3.	BTCB 126	Universal Human Values-II	II	2	1	0	3
4.	BTCB 128	Business Communication	II	3	0	0	3
5.	BTCB 129	Modern Indian Languages	II	3	0	0	3
6.	BTCB 233	Principles of Management	III	3	0	0	3
7.	BTCB 356	Human Resource Management and Organizational Behaviour	V	3	0	0	3
Total Credits							19

BASIC SCIENCE COURSES [CSBS]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 114	Fundamentals of Mathematics	I	4	0	0	4
2.	BTCB 112	Fundamentals of Business System	I	3	0	0	3
3.	BTCB 113	Business Ethics and Values	I	3	0	0	3
4.	BTCB 122	Principles of Economics	II	3	0	0	3
5.	BTCB 124	Applied Linear algebra	II	3	0	0	3
6.	BTCB 236	Probability and Statistics	III	3	0	0	3
7.	BTCB 247	Discrete Mathematics	IV	3	1	0	4
Total Credits							23

ENGINEERING SCIENCE COURSES [CSES]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 111	Fundamentals of Computer and Problem-Solving Techniques with lab	I	3	0	2	4
2.	BTCB 116	Fundamentals of Digital Electronics with lab	I	3	0	2	4
3.	BTCB 121	Computer Programming using Python with lab	II	3	0	2	4
4.	BTCB 123	Fundamentals of Business Accounting	II	3	0	0	3
5.	BTCB 125	IT Workshop (Sci lab/MATLAB) with lab	II	1	0	4	3
6.	BTCB 234	Object Oriented Programming	III	3	0	0	3
7.	BTCB 235	Microprocessor and Microcontroller	III	3	0	0	3
8.	BTCB 237	Accounting Software Lab (Skill Course)	III	0	0	4	2
9.	BTCB 246	Fundamentals of Financial Management	IV	3	0	0	3
10.	BTCB 368	Data Analytics lab (Skill Course)	VI	0	0	4	2
Total Credits							31

PROFESSIONAL CORE COURSES [CSPC]

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 231	Data Structures with Lab	III	3	0	2	4
2.	BTCB 232	Database Management Systems with Lab	III	3	0	2	4
3.	BTCB 241	Computer Organization and Architecture	IV	3	0	0	3
4.	BTCB 242	Design and Analysis of Algorithms	IV	3	0	2	4
5.	BTCB 243	Theory of Computation	IV	3	0	0	3
6.	BTCB 244	Advanced Java Programming with lab	IV	3	0	0	3
7.	BTCB 245	Artificial Intelligence	IV	3	0	0	3
8.	BTCB 248	Full Stack Development Lab (Skill Course)	IV	0	0	4	2
9.	BTCB 351	Indian Financial System	V	3	0	0	3

10.	BTCB 352	Computer Networks with Lab	V	3	0	2	4
11.	BTCB 353	Compiler Design	V	3	0	2	4
12.	BTCB 354	Operating System with Lab	V	3	0	2	4
13.	BTCB 355	Parallel and Distributed Computing	V	3	0	0	3
14.	BTCB 357	Financial Analysis and Planning lab (Skill Course)	V	0	0	4	2
15.	BTCB 361	Marketing Management	VI	3	0	0	3
16.	BTCB 362	Lean Start-Up Management	VI	3	0	0	3
17.	BTCB 363	Information Security with Lab	VI	3	0	2	4
18.	BTCB 364	Software Engineering and Agile Software Development with lab	VI	3	0	2	4
19.	BTCB 365	Information System Control and Audit	VI	3	0	0	3
20.	BTCB 471	Advanced Financial Analysis and Planning Lab	VII	0	0	4	2
21.	BTCB 472	Security Analysis and Portfolio Management	VII	3	0	2	4
22.	BTCB 473	Strategic Management	VII	3	0	0	3
23.	BTCB 481	Blockchain and Cryptocurrencies	VIII	3	0	0	3
24.	BTCB 482	Big Data and Cloud Computing	VIII	3	0	2	4
Total Credits for UG CSBS							79
MBA (BANKING TECHNOLOGY) - PG CORE COURSES							
25.	BTCB 591	Banking Technology Management	IX	3	0	2	4
26.	BTCB 592	Banking Operations Management	IX	3	0	0	3
27.	BTCB 593	Risk Management in Banks	IX	3	0	0	3
28.	BTCB 594	International Banking and Forex Trade	IX	3	0	2	4
29.	BTCB 595	Business Intelligence in Banking	IX	3	0	0	3
30.	BTCB 596	Digital Transformation for Banks	IX	3	0	0	3
31.	BTCB 597	Digital Assets Management	IX	3	0	0	3
MBA (FINANCIAL TECHNOLOGY) - PG CORE COURSES							
32.	BTCB 591	Financial Technology Management	IX	3	0	2	4
33.	BTCB 592	Digital Business Models	IX	3	0	0	3
34.	BTCB 593	Entrepreneurship in Fintech	IX	3	0	0	3
35.	BTCB 594	Project Planning and Financing	IX	3	0	0	3

36.	BTCB 595	Applied Financial Analytics	IX	3	0	0	3
37.	BTCB 596	International Finance and Forex Trade	IX	3	0	2	4
38.	BTCB 597	Business Intelligence	IX	3	0	0	3
39.	BTCB 598	Critical Thinking and Problem Identification / Research Methodology	X	3	1	0	4
Total Credits for PG MBA							27

PROFESSIONAL ELECTIVE COURSES [CSPE]

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 7XX	Professional Elective-I	VI	3	0	0	3
2.	BTCB 7XX	Professional Elective-II	VII	3	0	0	3
3.	BTCB 7XX	Professional Elective-III	VII	3	0	0	3
4.	BTCB 7XX	Professional Elective-IV	VIII	3	0	0	3
Total Credits							12

OPEN ELECTIVE COURSES [CSOE]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 7XX	Open Elective-I	VII	3	0	0	3
2.	BTCB 7XX	Open Elective-II	VIII	3	0	0	3
3.	BTCB 7XX	Open Elective-III	VIII	3	0	0	3
Total Credits							9

Note: Open Elective Courses are offered to the students of other Departments.

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

S. No	Course Code	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 367	Mini Project	VI	0	0	8	4
2.	BTCB 477	Seminar	VII	0	0	2	1
3.	BTCB 478	Capstone Project -I	VII	0	0	12	6
4.	BTCB 486	Capstone Project-II	VIII	0	0	12	6
5.	BTCB 487	Internship	VIII	0	0	0	0
MBA- PG COURSE							
6.	BTCB 599	Internship / Research Project	X	0	0	36	18
Total Credits							35

MANDATORY COURSES [CSMC]

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	MBPR 001	Induction Program (UHV-I)	I	3 Weeks			0
2.	BTCB 249	Environmental Sciences	IV	3	-	-	0
3.	BTCB 358	Constitution of India	V	3	-	-	0
Total Credits							0

COMMUNITY ENGAGEMENT/ AUDIT COURSES [CSAU]

S.No.	Course Code	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 117	IDEA Lab Workshop	I	2	0	4	0
2.	BTCB 127	Sports and Yoga	II	2	0	0	0
3.	BTCB 238	Community Engagement and Service	III	0	0	4	2
Total Credits							2

S.No	Course Category	Credits per Semester										Total Credits
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1.	Humanities and Social Sciences (HS)	4	9	3	-	3	-	-	-	-	-	19
2.	Basic Sciences (BS)	10	6	3	4	-	-	-	-	-	-	23
3.	Engineering Sciences (ES)	8	10	8	3	-	2	-	-	-	-	31
4.	Professional Core (PC)	-	-	8	18	20	17	9	7	23	4	106
5.	Professional Electives (PE)	-	-	-	-	-	3	6	3	-	-	12
6.	Open Electives (OE)	-	-	-	-	-	-	3	6	-	-	09
7.	Project Work/Seminar/ Internship (PROJ)	-	-	-	-	-	4	7	7	-	18	36
8.	Mandatory Courses (MC) /Audit Courses (AU)	0	0	2	0	0	-	-	-	-	-	2
		22	25	24	25	23	26	25	23	23	22	238

➤ **Category-wise Courses for NEP 2023 REGULATION**

MAJOR COURSES [MBMA]

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 111	Fundamentals of Computer and Problem-Solving Techniques with lab	I	3	0	2	4
2.	BTCB 121	Computer Programming using Python with lab	II	3	0	2	4
3.	BTCB 231	Data Structures with Lab	III	3	0	2	4
4.	BTCB 232	Database Management Systems with Lab	III	3	0	2	4
5.	BTCB 241	Computer Organization and Architecture	IV	3	0	0	3
6.	BTCB 242	Design and Analysis of Algorithms	IV	3	0	2	4
7.	BTCB 243	Theory of Computation	IV	3	0	0	3
8.	BTCB 244	Advanced Java Programming with lab	IV	3	0	0	3
9.	BTCB 245	Artificial Intelligence	IV	3	0	0	3
10.	BTCB 351	Indian Financial System	V	3	0	0	3
11.	BTCB 352	Computer Networks with Lab	V	3	0	2	4
12.	BTCB 353	Compiler Design	V	3	0	2	4
13.	BTCB 354	Operating System with Lab	V	3	0	2	4
14.	BTCB 355	Parallel and Distributed Computing	V	3	0	0	3
15.	BTCB 361	Marketing Management	VI	3	0	0	3
16.	BTCB 362	Lean Start-Up Management	VI	3	0	0	3
17.	BTCB 363	Information Security with Lab	VI	3	0	2	4
18.	BTCB 364	Software Engineering and Agile Software Development with lab	VI	3	0	2	4
19.	BTCB 365	Information System Control and Audit	VI	3	0	0	3
20.	BTCB 471	Advanced Financial Analysis and Planning Lab	VII	0	0	4	2
21.	BTCB 472	Security Analysis and Portfolio Management	VII	3	0	2	4
22.	BTCB 473	Strategic Management	VII	3	0	0	3

23.	BTCB 478	Capstone Project-I / Internship	VII	0	0	12	6
24.	BTCB 481	Blockchain and Cryptocurrencies	VIII	3	0	0	3
25.	BTCB 482	Big Data and Cloud Computing	VIII	3	0	2	4
26.	BTCB 486	Capstone Project-II	VIII	0	0	12	6
27.	BTCB 487	Internship	VIII	0	0	2	1
Total Credits for UG CSBS							96
MBA (BANKING TECHNOLOGY) - PG CORE COURSES							
26.	BTCB 591	Banking Technology Management	IX	3	0	2	4
27.	BTCB 592	Banking Operations Management	IX	3	0	0	3
28.	BTCB 593	Risk Management in Banks	IX	3	0	0	3
29.	BTCB 594	International Banking and Forex Trade	IX	3	0	2	4
30.	BTCB 595	Business Intelligence in Banking	IX	3	0	0	3
31.	BTCB 596	Digital Transformation for Banks	IX	3	0	0	3
32.	BTCB 597	Digital Assets Management	IX	3	0	0	3
MBA (FINANCIAL TECHNOLOGY) - PG CORE COURSES							
33.	BTCB 591	Financial Technology Management	IX	3	0	2	4
34.	BTCB 592	Digital Business Models	IX	3	0	0	3
35.	BTCB 593	Entrepreneurship in Fintech	IX	3	0	0	3
36.	BTCB 594	Project Planning and Financing	IX	3	0	0	3
37.	BTCB 595	Applied Financial Analytics	IX	3	0	0	3
38.	BTCB 596	International Finance and Forex Trade	IX	3	0	2	4
39.	BTCB 597	Business Intelligence	IX	3	0	0	3
40.	BTCB 599	Internship / Research Project	X	0	0	36	18
Total Credits for PG MBA							41

MINOR COURSES [MBMI]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 112	Fundamentals of Business System	I	3	0	0	3
2.	BTCB 113	Business Ethics and Values	I	3	0	0	3
3.	BTCB 122	Principles of Economics	II	3	0	0	3
4.	BTCB 233	Principles of Management	III	3	0	0	3
5.	BTCB 234	Object Oriented Programming	III	3	0	0	3
6.	BTCB 235	Microprocessor and Microcontroller	III	3	0	0	3
7.	BTCB 246	Fundamentals of Financial Management	IV	3	0	0	3
8.	BTCB 356	Human Resource Management and Organizational Behaviour	V	3	0	0	3
9.	BTCB 7XX	Professional Elective - I	VI	3	0	0	3
10.	BTCB 7XX	Professional Elective – II	VII	3	0	0	3
11.	BTCB 7XX	Professional Elective – III	VII	3	0	0	3
12.	BTCB 7XX	Professional Elective - IV	VIII	3	0	0	3
Total Credits							36

MULTI DISCIPLINE COURSES [MBMD]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 114	Fundamentals of Mathematics	I	3	1	0	4
2.	BTCB 116	Fundamentals of Digital Electronics with lab	I	3	0	2	4
3.	BTCB 123	Fundamentals of Business Accounting	II	3	0	0	3
4.	BTCB 124	Applied Linear Algebra	II	3	0	0	3
5.	BTCB 236	Probability and Statistics	III	3	0	0	3
6.	BTCB 247	Discrete Mathematics	IV	3	1	0	4
7.	BTCB 7XX	Open Elective-I	VII	3	0	0	3
8.	BTCB 7XX	Open Elective-II	VIII	3	0	0	3
10.	BTCB 7XX	Open Elective-III	VIII	3	0	0	3
Total Credits							30

ABILITY ENHANCEMENT COURSES [MBAE]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	ENAE 111	English-I	I	2	0	2	3
2.	BTCB 128	Business Communication	II	3	0	0	3
3.	BTCB 129	Modern Indian Languages	II	3	0	0	3
4.	BTCB 358	Constitution of India	V	3	-	-	0
5.	BTCB 477	Seminar	VII	0	0	2	1
Total Credits							10

SKILL ENHANCEMENT COURSES [MBSE]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 115	Design Thinking	I	0	0	2	1
	BTCB 125	IT Workshop (Sci lab/MATLAB) with lab	II	1	0	4	3
2.	BTCB 237	Accounting Software Lab (Skill Course)	III	0	0	4	2
3.	BTCB 248	Full Stack Development Lab (Skill Course)	IV	0	0	4	2
4.	BTCB 357	Financial Analysis and Planning lab (Skill Course)	V	0	0	4	2
5.	BTCB 359	Industrial Visit	V	0	0	0	0
6.	BTCB 367	Mini Project	VI	0	0	8	4
7.	BTCB 368	Data Analytics lab (Skill Course)	VI	0	0	4	2
8.	BTCB 598	Critical Thinking and Problem Identification / Research Methodology	X	3	1	0	4
Total Credits							20

VALUE ADDED COURSES [MBVA]

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 117	IDEA Lab Workshop	I	2	0	4	0
2.	BTCB 126	Universal Human Values-II	II	2	1	0	3
3.	BTCB 127	Sports and Yoga	II	2	0	0	0
4.	BTCB 238	Community Engagement and Service	III	0	0	4	2
5.	BTCB 249	Environmental Science	IV	3	0	0	0
Total Credits							05

S.No	Course Category	Credits per Semester										Total Credits
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1.	Major Courses (MA)	4	4	8	16	18	17	15	14	23	18	137
2.	Minor Courses (MI)	6	3	9	3	3	3	6	3	-	-	36
3.	Multi Discipline Courses (MD)	8	6	3	4	-	-	3	6	-	-	30
4.	Ability Enhancement Courses (AE)	3	6	-	-	-	-	1	-	-	-	10
5.	Skill Enhancement Courses (SE)	1	3	2	2	2	6	-	-	-	4	20
6.	Value Added Courses (VA)	-	3	2	-	-	-	-	-	-	-	05
		22	25	24	25	23	26	25	23	23	22	238

OVERLAPPING COURSES FOR MBA CREDITS WITH B.TECH., CREDITS

S.No.	Course Code	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BTCB 112	Fundamentals of Business System	I	3	0	0	3
2.	BTCB 113	Business Ethics and Values	I	3	0	0	3
3.	BTCB 122	Principles of Economics	II	3	0	0	3
4.	BTCB 123	Fundamentals of Business Accounting	II	3	0	0	3
5.	BTCB 233	Principles of Management	III	3	0	0	3
6.	BTCB 237	Accounting Software Lab (Skill Course)	III	0	0	4	2
7.	BTCB 246	Fundamentals of Financial Management	IV	3	0	0	3
8.	BTCB 351	Indian Financial System	V	3	0	0	3
9.	BTCB 356	Human Resource Management and Organizational Behaviour	V	3	0	0	3
10.	BTCB 357	Financial Analysis and Planning lab	V	0	0	4	2
11.	BTCB 361	Marketing Management	VI	3	0	0	3
12.	BTCB 362	Lean Start-Up Management	VI	3	0	0	3
13.	BTCB 363	Information Security with Lab	VI	3	0	2	4
14.	BTCB 364	Software Engineering and Agile Software Development with lab	VI	3	0	2	4
15.	BTCB 365	Information System Control and Audit	VI	3	0	0	3
16.	BTCB 368	Data Analytics lab (Skill Course)	VI	0	0	4	2
17.	BTCB 471	Advanced Financial Analysis and Planning Lab	VII	0	0	4	2
18.	BTCB 472	Security Analysis and Portfolio Management	II	3	0	2	4
19.	BTCB 473	Strategic Management	VII	3	0	0	3
Total Credits							56

INDUCTION PROGRAM

The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program', as available on AICTE Portal,(Link:<https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf>).

Induction program(mandatory)	Three-weekduration
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none">• Physical activity• Creative Arts• Universal Human Values• Literary• Proficiency Modules• Lectures by Eminent People• Visits to local Areas• Familiarization to Dept./ Branch & Innovations

Mandatory Visits /Workshop / Expert Lectures

- a. It is mandatory to arrange one industrial visit every semester for the student of each branch
- b. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on Professional/Industry/ Entrepreneurial Orientation.
- c. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry.

Curriculum- 2024-2025(Onwards)
SEMESTER I

COURSE CODE	COURSE TITLE	L-T-P-C
MBPR 001	3 WEEK INDUCTION PROGRAMME (UHV-I)	
BTCB 111	Fundamentals of Computer and Problem-Solving Techniques with lab	3-0-2-4
BTCB 112	Fundamentals of Business Systems	3-0-0-3
BTCB 113	Business Ethics and Values	3-0-0-3
BTCB 114	Fundamentals of Mathematics	4-0-0-4
BTCB 115	Design Thinking	0-0-2-1
BTCB 116	Fundamentals of Digital Electronics with lab	3-0-2-4
ENAE 111	English I	3-0-0-3
BTCB 117	IDEA Lab Workshop (Non-Credit)	2-0-4-0
Total Credits		22

SEMESTER II

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 121	Computer Programming using Python with lab	3-0-2-4
BTCB 122	Principles of Economics	3-0-0-3
BTCB 123	Fundamentals of Business Accounting	3-0-0-3
BTCB 124	Applied Linear Algebra	3-0-0-3
BTCB 125	IT Workshop (Sci lab/MATLAB) with lab	1-0-4-3
BTCB 126	Universal Human Values-II	2-1-0-3
BTCB 127	Sports and Yoga (Non-Credit)	2-0-0-0
BTCB 128	Business Communication	3-0-0-3
BTCB 129	Modern Indian Languages	3-0-0-3
Total Credits		25

After 1st Year Exit: Internship during summer (Exit Requirement: 4 Credits for Skill & 6 Credits for Internship): **10 Credits**

NEP PU Guidelines

- ❖ Students exiting the programme after securing 40 credits will be awarded UG Certificate in the relevant Discipline/Subject provided they secure 4 credits in work based vocational courses offered during summer term or internship / Apprenticeship in addition to 6 credits from skill-based courses earned during first and second semester.
- ❖ UG Certificate can be offered in multiple streams pertaining to the major discipline – eg. In the discipline of Commerce, certificates may be offered in Accounting, Taxation and Auditing and so on as separate streams.
- ❖ The student decides either to continue with the chosen major or request a change of major at the end of 2nd semester.
- ❖ The student declares the choice of minors and vocational stream related to the minor at the end of second semester after exploring various courses.

(The minor stream courses include vocational courses which will help the students to equip with job oriented skills. The Skill Courses suggested are Office Automation Associate and Accounting package)

SEMESTER III

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 231	Data Structures with Lab	3-0-2-4
BTCB 232	Database Management Systems with Lab	3-0-2-4
BTCB 233	Principles of Management	3-0-0-3
BTCB 234	Object Oriented Programming	3-0-0-3
BTCB 235	Microprocessor and Microcontroller	3-0-0-3
BTCB 236	Probability and Statistics	3-0-0-3
BTCB 237	Accounting Software Lab (Skill Course)	0-0-4-2
BTCB 238	Community Engagement and Service	0-0-4-2
Total Credits		24

SEMESTER IV

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 241	Computer Organization and Architecture	3-0-0-3
BTCB 242	Design and Analysis of Algorithms	3-0-0-3
BTCB 243	Theory of Computation	3-0-0-3
BTCB 244	Advanced Java Programming with lab	3-0-2-4
BTCB 245	Artificial Intelligence	3-0-0-3
BTCB 246	Fundamentals of Financial Management	3-0-0-3
BTCB 247	Discrete Mathematics	3-1-0-4
BTCB 248	Full Stack Development Lab (Skill Course)	0-0-4-2
BTCB 249	Environmental Science (Non-Credit)	3-0-0-0
Total Credits		25

After 2nd Year Exit: Internship during summer (Exit Requirement: 4 Credits for Skill & 6 Credits for Internship): **10 Credits**

NEP PU Guidelines

- ❖ Students exiting the programme after securing 80 credits will be awarded UG Diploma in the relevant Discipline /Subject, provided they secure additional 4 credits in work based vocational courses offered during summer term or internship / Apprenticeship.
- ❖ UG Diploma can be offered in multiple streams pertaining to the major discipline. Summer Internship could be initiated during holidays and continued to the V semester. (The skill course suggested are Web Development and Tax Preparation and Filing)

SEMESTER V

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 351	Indian Financial System	3-0-0-3
BTCB 352	Computer Networks with Lab	3-0-2-4
BTCB 353	Compiler Design	3-0-2-4
BTCB 354	Operating System with Lab	3-0-2-4
BTCB 355	Parallel and Distributed Computing	3-0-0-3
BTCB 356	Human Resource Management and Organizational Behaviour	3-0-0-3
BTCB 357	Financial Analysis and Planning lab (Skill Course)	0-0-4-2
BTCB 358	Constitution of India (Non-Credit)	3-0-0-0
BTCB 359	Industrial Visit	Non-Credit
Total Credits		23

SEMESTER VI

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 361	Marketing Management	3-0-0-3
BTCB 362	Lean Start-Up Management	3-0-0-3
BTCB 363	Information Security with Lab	3-0-2-4
BTCB 364	Software Engineering and Agile Software Development with lab	3-0-2-4
BTCB 365	Information System Control and Audit	3-0-0-3
BTCB 7XX	Professional Elective - 1	3-0-0-3
BTCB 366	Mini Project	0-0-8-4
BTCB 367	Data Analytics lab (Skill Course)	0-0-4-2
Total Credits		26

After 3rd Year Exit: Internship during summer (Exit Requirement: 4 Credits for Skill & 6 Credits for Internship): **10 Credits**

NEP PU Guidelines

- ❖ Students who want to undertake 3-year UG programme will be awarded UG degree in the relevant discipline /subject upon securing 122 credits.
- ❖ A minimum of 12 credits will be allotted to the minor stream relating to vocational education and training spreading through 2, 3, 4 &5 semesters.
- ❖ Internship is included as the major 11 course.

SEMESTER VII

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 471	Advanced Financial Analysis and Planning Lab	0-0-4-2
BTCB 472	Security Analysis and Portfolio Management	3-0-2-4
BTCB 473	Strategic Management	3-0-0-3
BTCB 7XX	Professional Elective - 2	3-0-0-3
BTCB 7XX	Professional Elective - 3	3-0-0-3
BTCB 7XX	Open Elective – 1	3-0-0-3
BTCB 474	Seminar	0-0-2-1
BTCB 475	Capstone Project -I / Internship	0-0-12-6
Total Credits		25

SEMESTER VIII

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 481	Blockchain and Cryptocurrencies	3-0-0-3
BTCB 482	Big Data and Cloud Computing	3-0-2-4
BTCB 483	Professional Elective - 4	3-0-0-3
BTCB 7XX	Open Elective -2	3-0-0-3
BTCB 7XX	Open Elective -3	3-0-0-3
BTCB 484	Capstone Project -II	0-0-12-6
BTCB 485	Internship	0-0-2-1
Total Credits		23

NEP PU Guidelines

- ❖ Students will be awarded UG degree (honours) with research in the relevant discipline /subject provided they secure 164 credits
- ❖ Honours students not undertaking research will do 3 courses for 12 credits in lieu of a research project / dissertation.
- ❖ Students of UG honours with research will choose a research component in the 4th year and complete research methodology courses and advanced courses in major/minor.

M.B.A – BANKING TECHNOLOGY

SEMESTER IX

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 591	Banking Technology Management	3-0-2-4
BTCB 592	Banking Operations Management	3-0-0-3
BTCB 593	Risk Management in Banks	3-0-0-3
BTCB 594	International Banking and Forex Trade	3-0-2-4
BTCB 595	Business Intelligence in Banking	3-0-0-3
BTCB 596	Digital Transformation for Banks	3-0-0-3
BTCB 597	Digital Assets Management	3-0-0-3
Total Credits		23

SEMESTER X

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 598	Critical Thinking and Problem Identification [#] / Research Methodology [*]	3-1-0-4
BTCB 599	Internship / Research Project	0-0-36-18
Total Credits		22

- If student would like to pursue internship then he/she has to study Critical Thinking and Problem Identification Course.

**- If student would like to pursue research then he/she has to study Research Methodology Course.*

M.B.A – FINANCIAL TECHNOLOGY

SEMESTER IX

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 591	Financial Technology Management	3-0-2-4
BTCB 592	Digital Business Models	3-0-0-3
BTCB 593	Entrepreneurship in Fintech	3-0-0-3
BTCB 594	Project Planning and Financing	3-0-0-3
BTCB 595	Applied Financial Analytics	2-0-2-3
BTCB 596	International Finance and Forex Trade	3-0-2-4
BTCB 597	Business Intelligence	2-0-2-3
Total Credits		23

SEMESTER X

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 598	Critical Thinking and Problem Identification [#] / Research Methodology [*]	3-1-0-4
BTCB 599	Internship / Research Project	0-0-36-18
Total Credits		22

- If student would like to pursue internship then he/she has to study Critical Thinking and Problem Identification Course.

**- If student would like to pursue research then he/she has to study Research Methodology Course.*

HONOR COURSES

S.No.	COURSE CODE	COURSE TITLE	L-T-P-C
1.	BTCB 611	System Software	3-1-0-4
2.	BTCB 612	Computer Graphics	3-1-0-4
3.	BTCB 613	Digital Image Processing	3-1-0-4
4.	BTCB 614	Rural Banking & Micro-Finance	3-1-0-4
5.	BTCB 615	Legal Aspects of Banking and Finance	3-1-0-4
Total Credits			20

MINOR COURSES

S.No.	COURSE CODE	COURSE TITLE	L-T-P-C
1.	BTCB 616	Data Structures	3-1-0-4
2.	BTCB 617	Principles of Database Systems	3-1-0-4
3.	BTCB 618	Network Technology	3-1-0-4
4.	BTCB 619	Central Banking and Monetary Policy	3-1-0-4
5.	BTCB 620	Digital Marketing and CRM	3-1-0-4
			20

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No	Course Code	Course Title	Periods			Credits
			Lecture	Tutorial	Practical	
1.	BTCB 701	Human Computer Interaction	3	0	0	3
2.	BTCB 702	Machine Learning	3	0	0	3
3.	BTCB 703	Open Source Software	3	0	0	3
4.	BTCB 704	UI and UX Design	3	0	0	3
5.	BTCB 705	Augmented Reality/ Virtual Reality	3	0	0	3
6.	BTCB 706	Graphics and Image Processing	3	0	0	3
7.	BTCB 707	Mobile Application Development	3	0	0	3
8.	BTCB 708	Wireless Sensor Networks	3	0	0	3
9.	BTCB 709	Next Generation Networks	3	0	0	3
10.	BTCB 710	Internet of Things	3	0	0	3
11.	BTCB 711	Optimization Techniques	3	0	0	3
12.	BTCB 712	Deep Learning	3	0	0	3
13.	BTCB 713	Knowledge Engineering	3	0	0	3
14.	BTCB 714	Natural Language Processing	3	0	0	3
15.	BTCB 715	Artificial Neural Networks	3	0	0	3
16.	BTCB 716	Multimedia and Animation	3	0	0	3
17.	BTCB 717	Financial Modelling	3	0	0	3
18.	BTCB 718	Forex and Currency Derivatives	3	0	0	3
19.	BTCB 719	Retail Banking	3	0	0	3
20.	BTCB 720	Central Banking & Policy Development	3	0	0	3
21.	BTCB 721	Corporate Restructuring	3	0	0	3
22.	BTCB 722	Merchant Banking and Financial Services	3	0	0	3
23.	BTCB 723	Corporate Governance & Business Ethics	3	0	0	3
24.	BTCB 724	Cyber Crimes and IT Laws	3	0	0	3
25.	BTCB 725	Risk Management in Banks	3	0	0	3
26.	BTCB 726	Prudential Management for Banker	3	0	0	3
27.	BTCB 727	Sustainable Finance	3	0	0	3
28.	BTCB 728	Startup Financing	3	0	0	3
29.	BTCB 729	Insurance and Risk Management	3	0	0	3
30.	BTCB 730	Decentralized Finance (DeFi)	3	0	0	3

OPEN ELECTIVE / MULTIDISCIPLINARY COURSES OFFERED UNDER NEP 2020

COURSE CODE	LIST OF COURSE	L-T-P-C
BTCB 731	Financial Technology and Development	3-0-0-3
BTCB 732	Banking Technology and Development	3-0-0-3
BTCB 733	Introduction to Cyber Security and IT Laws	3-0-0-3
BTCB 734	Introduction to Financial System and Banking	3-0-0-3
BTCB 735	Design Thinking and Creativity	3-0-0-3
BTCB 736	Ecosystem for Fintech	3-0-0-3

Note: Open Elective Courses are offered to the students of other Departments.

Semester Wise Syllabus for 5 Years Integrated B.Tech., M.B.A (CSBS)

SEMESTER I

COURSE CODE	COURSE TITLE	L-T-P-C
MBPR 001	3 WEEK INDUCTION PROGRAMME (UHV-I)	
BTCB 111	Fundamentals of Computer and Problem-Solving Techniques with lab	3-0-2-4
BTCB 112	Fundamentals of Business Systems	3-0-0-3
BTCB 113	Business Ethics and Values	3-0-0-3
BTCB 114	Fundamentals of Mathematics	4-0-0-4
BTCB 115	Design Thinking	0-0-2-1
BTCB 116	Fundamentals of Digital Electronics with lab	3-0-2-4
ENAE 111	English I	3-0-0-3
BTCB 117	IDEA Lab Workshop (Non-Credit)	2-0-4-0
	Total Credits	22

Subject Code BTCB 111	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	FUNDAMENTALS OF COMPUTER AND PROBLEM-SOLVING TECHNIQUES WITH LAB	<i>Multidiscipline</i>
Course Objectives:		
1. To familiarize the key concepts of computational thinking and problem solving techniques. 2. To explore the fundamental concepts of algorithms, array, searching techniques and recursive algorithms.		
Course Outcomes:		
On completion of the course, the students will be able to CO1. Discuss the basic concepts of computational thinking and problem solving. CO2. Interpret the concepts of algorithm and data organization. CO3. Illustrate algorithmic solution to problem solving. CO4. Execute the concepts of array, merging, sorting & searching. CO5. Implement recursive algorithm to solve problems.		
Pedagogy: Lectures , Lab exercises, Assignment		
Unit I: Basics of Computers		7 Hrs
Components of Computer System, Concept of Hardware, Software, Evolution of computer and Generations, Types of Computers – Analog and Digital computers, Hybrid Computers, General Purpose and Special Purpose Computer, Concept of computing, data and information		
Unit II: Computational Thinking		8 Hrs
Data Types & Encoding - Logic-Solving Problems- Limits of Computation - Pseudocode & Flow Chart. Data Organization: Name list, Graph Hierarchies - Spreadsheets -Text processing – Patterns.		
Unit III: Fundamentals of Algorithms		10 Hrs
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).		
Unit IV: Array Techniques		10 Hrs
Introduction - Array order reversal - Array Counting or Histogramming – Maximum and Minimum of a Set - Removal of Duplicate – Partitioning - Longest monotone. Merging sorting and searching: Two Way Merge - Sorting by Selection, Insertion, Exchanging, Diminishing, Increment, and Partitioning. Searching: Binary – Hashing.		
Unit V: Searching Techniques		10 Hrs
Keyword Searching - Text Line Adjustment - Linear Pattern Search - Sub Linear Pattern Search. Recursion: Binary Tree Traversal - Recursive Quick Sort - Towers of Hanoi - Sample Generation - Combination Generation - Permutation Generation.		
Text Books:		
1. David Riley and Kenny Hunt, Computational Thinking for Modern Problem Solver, Chapman & Hall / CRC Press, 2014. 2. R. G.Dromey, how to solve it by Computer, PHI, 2008. 3. Vickers Paul, How to Think like a Programmer: Problem Solving for the Bewildered, Cengage Learning, 2008. 4. V. Anton Spraul, Think Like a Programmer: An Introduction to Creative Problem Solving, Cengage Learning, 2012.		

S.No.	List of Indicative Experiments	Hours
1	Program to exchange numbers. Program to find the factorial of a number.	3 hours
2	Program to reverse a digit and character to number conversion	3 hours
3	Program using factoring methods (Square root, GCD, Prime Number)	3 hours
4	Program for pseudorandom numbers. Program to reverse an array.	3 hours
5	Program to count the elements in an array and to remove the duplicate elements.	3 hours
6	Program using sorting techniques (merge, selection, Insertion, quick)	3 hours
7	Program using search techniques (Binary, Linear, Hashing)	3 hours
8	Program for pattern search (Linear, sub-Linear)	3 hours
9	Program for Towers of Hanoi problem.	3 hours
10	Program for Combination and permutation Generation.	3 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	2	2	-	-	-	-	-	-	2	3	2	3
CO2	2	2	-	2	2	-	-	-	-	-	-	2	3	2	3
CO3	2	2	-	3	2	-	-	-	-	-	-	2	3	3	3
CO4	2	2	-	3	2	-	-	-	-	-	-	2	3	3	3
CO5	3	3	-	3	2	-	-	-	-	-	-	2	3	3	3
Avg	2.2	2.2	-	2.6	2	-	-	-	-	-	-	2	3	2.6	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 112	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	FUNDAMENTALS OF BUSINESS SYSTEM	<i>Minor</i>
<i>Course Objectives:</i>		
1. To introduce concepts and theories of business system in India 2. To facilitate the application of the concepts and theories into business environment		
<i>Course Outcome:</i>		
On completion of the course, the students will be able to:		
CO1. Understand the concepts of business system and models		
CO2. Acquire the required skill sets for business system and model		
CO3. Apply the skills in designing innovative business system and models		
CO4. Analyse successful business system and models		
CO5. Design suitable business system and model		
<i>Pedagogy:</i> Lecture, Discussion, Case studies, Presentation, Assignments & Management games		
UNIT I: INTRODUCTION		8 Hrs
Meaning and Objectives of Business System – Types of business system - Basics of business – types of business organisation – importance and significance – business ethics and governance – social responsibility of business.		
UNIT – II: BUSINESS ENVIRONMENT		12 Hrs
Concept – Significance – Factors influencing business – Social environment – Economic environment – Political environment – Technological environment – Legal environment - Environmental influence on Business- Governance		
UNIT- III: FINANCIAL SYSTEM		12 Hrs
Structure of Financial System – Financial Market – Financial Institutions - Instruments and Institutions – Financial instruments and services - Innovative Instruments-Financial regulations - Regulators in India		
UNIT IV: FORMS OF BUSINESS		6 Hrs
Forms of organisations-Sole tradership-Partnership firms-LLP-Joint stock companies -HUF-Family-Cooperatives- Business-MNCs-Public sector & Private sector- Governance and management		
UNIT – V: BUSINESS MODELS		7 Hrs
Types of business- Manufacturing sector -Service sectors- BFSI - Engineering- Agri business- Application of technology -E-Commerce-Emerging developments		
<i>Text Books:</i>		
1. Stephen J. Skripak, Virginia Tech, Fundamentals of Business - 4th Edition, 2023.		
2. Pailwar V.K, Business Environment Paperback, Prentice Hall India Learning, 2014		
3. Puri,V.K and Misra,S.K., Economic Environment Of Business, Himalaya Publishing House.		
4. Stephen J. Skripak, Fundamentals of Business Paperback, 2018		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3											2	3	
CO3		3	3	2						2			3	3	
CO4		3	3	3	2		2				3	3		3	3
CO5		3	3	3			3	3			3	2			3
Ave	3	3	3	2.7	2	-	2.5	3	-	2	3	2.5	2.7	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 113	Subject Title	L T P C 3-0-0-3
<i>Cognitive</i>	BUSINESS ETHICS AND VALUES	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> 1. To Impart the concept of Indian Business Models and Ethics 2. To illustrate the applications of Indian Business Models, Ethics, Values and Professional Etiquettes 		
Course Outcome:		
On completion of the course, the students will able to:		
CO1. Identify and recall key principles and characteristics of Indian Business Models, Ethics, Values, and Professional Etiquettes		
CO2. Explain the impact and significance of Indian Business Models, Ethics, and Values in relation to professional business etiquette and development		
CO3. Apply the principles of Indian Business Models and Ethical practices to case studies and real-world business situations for sustainable development		
CO4. Compare and analyse the key differences between Western and Indian Business Models, particularly focusing on their ethical dimensions and management practices		
CO5. Evaluate the effectiveness of various Indian business models and ethical practices and Develop and propose new business models or ethical frameworks		
Pedagogy: Lectures, Seminars, Assignments, Quiz, Project, Case Study		
Unit I: Business Models		10 Hrs
Western Business Models – Eastern Business models – Universal Business Models – Business in Ancient India – Business during the British Domination – Business in Independent India – Business Models in present period – Non-Corporate Sector – Clusters – Corporate Sector.		
Unit II: Indian Business management Models and Values		9 Hrs
Basic features of Indian Business models – Basic features of western business models – Unique nature of Indian business models - Business Management models – Western management models – Indian management models – Need to understand the performing models – Success stories of various Business Models and its Values - Indian models for 21 st century.		
Unit III: Business Ethics		9 Hrs
Introduction to Ethics – Morality and Value system – Business Ethics – Importance of Ethics in Business - Business Culture and its impact – Types of Ethical Issues – Bribery and Corruption – Theft and Piracy – Coercion and Compulsion – Deception and Duplicity – Unfair Discrimination		
Unit IV: Types of Ethics		8 Hrs
Internal Ethic of Business – Hiring Employees – Screening Practices – Promotion – Wages – Exploitation of Employees – Discipline – Whistle Blowing. External Ethic – Ethics of Competition and Fair Prices – Consumer Rights – Ethics in Advertisement and False claims – Ethics of Environment Protection and pollution control - Social Responsibility of Business towards Shareholders, Employees, Customers, Dealers, Community and Government – Social Audit – Role of Corporate Governance.		
Unit V: Business Etiquettes		9 Hrs
Meaning and Importance of Etiquettes – Etiquettes in Business meeting, Board meeting, Shareholders meeting, Employees meeting, Press conference in Print and Electronic media – Dinning		

Manners – Lunch and Dinner meetings – Behaviour with Foreign Delegates – Manner of Shake hands, Dress Code – Corporate culture Functions – Etiquettes in Delivery of speeches and addressing the people.

Text Books:

1. **P. Kanagasabapathi, “Indian Models of Economy, Business and Management”,** PHI Learning
2. **Tulsian, P.C; “Business Organisation & Management”,** Pearson Education, New Delhi.
3. Senthil Kumar and Senthil Rajan “Business Ethics and Values’ Himalaya Publishing House
4. Dr. S. Sankaran, “Business Ethics and Values”, Margham Publications
5. Tejpalsethi.C.S “Business Ethics And Communication”, Schand Publication

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 114	Subject Title	L T P C 3 0 2 4
<i>Cognitive</i>	FUNDAMENTALS OF MATHEMATICS	Multidiscipline
Course Objectives:		
1. To comprehend the mathematical concepts of matrices, ordinary differential equations, multivariable calculus and problem-solving. 2. To compare the concept of partial derivatives, divergence and integration.		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1: To solve practical problems using Matrix algebra.		
CO2: To solve various types of ordinary differential equations, including higher-order linear equation.		
CO3: To compute partial derivatives, determine total derivatives, Jacobians, employ Taylor series, and find extremes of functions of two variables.		
CO4: To demonstrate proficiency in evaluating double integration and triple integration and using them to compute area and volume.		
CO5: To apply Green's theorem, Stoke's theorem and Gauss divergence theorem		
Pedagogy: <i>Lecture, Assignment</i>		
Unit I: LINEAR ALGEBRA (MATRICES)		12 Hrs
Rank of a matrix - Consistency of a system of linear equations – Characteristic equation of a matrix - Eigen values and Eigen vectors- Properties of Eigen values and Eigen vectors- Cayley-Hamilton theorem (excluding proof)- Verification- Application (Finding Inverse and Power of a matrix)- Diagonalization of a matrix by orthogonal and similarity transformation- Quadratic form – Nature of Quadratic Form- Orthogonal reduction of quadratic form to canonical form.		
Unit II: ORDINARY DIFFERENTIAL EQUATIONS		12 Hrs
Differential Equations of First Order- Exact equations- Leibnitz's linear equations- Bernoulli's equation- Equations solvable for p- Clairaut's equation- Differential equations of Higher order- Linear differential equations of higher order with constant coefficients- Euler's linear equation of higher order with variable coefficients- Method of variation of parameters.		
Unit III: MULTIVARIABLE CALCULUS (DIFFERENTIATION)		12 Hrs
Partial differentiation- Partial derivatives of first order and higher order- Partial differentiation of implicit functions- Euler's theorem on homogeneous functions – Total derivative - Jacobian Properties - Taylor's series for functions of two variables- Maxima and minima of functions of two variables.		
Unit IV: MULTIVARIABLE CALCULUS (MULTIPLE INTEGRALS)		12 Hrs
Double integration (Cartesian form and Polar form)- constant limits- variable limits- over the region R- Change of variables in double integrals (Cartesian to polar)- Application of double integral- Area by double integration- Change of Order of Integration- Triple Integration (Cartesian Spherical and Cylindrical)- constant limits- variable limits- over the region R- Application of triple integral- Volume by triple integration.		
Unit V: MULTIVARIABLE CALCULUS (VECTOR CALCULUS)		12 Hrs
Vector Differential Operator- Gradient - Properties - Directional derivative - Divergence and Curl Properties and relations- Solenoidal and Irrotational vector fields – Line integral and Surface integrals - Integral Theorems (excluding Proof) - Green's theorem - Stoke's theorem – Gauss divergence theorem.		

Text Books:

1. Veerarajan T., “Engineering Mathematics- I & II ”, Tata McGraw-Hill, New Delhi, 2014 & 2015.
2. Dr. M.K. Venkataraman, “Engineering Mathematics – Volume I and Volume II”, The National Publishing Company, Chennai 2008.
3. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
4. Bali N.P and Manish Goyal., “A Text Book of Engineering Mathematics”, Laxmi Publications(P) Ltd, 2011.
5. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley& Sons, New Delhi, 9th Edition, 2011.
6. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 2010.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	3	2	2
CO2	3	2	2	2	-	2	-	-	-	-	-	-	3	2	2
CO3	3	2	2	2	-	2	-	-	-	-	-	-	3	3	3
CO4	3	2	2	2	-	2	-	-	-	-	-	-	3	3	3
CO5	2	2	-	-	-	-	-	-	-	-	-	-	3	3	3
Avg	2.6	2	2	2	-	2	-	-	-	-	-	-	3	2.6	2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 115	Subject Title	L T P C 0 0 2 1
<i>Technical</i>	DESIGN THINKING	<i>Ability Enhancement</i>
Course Objectives:		
<ol style="list-style-type: none"> To understand the new ways of creative thinking To learn the innovation cycle of Design Thinking process for developing innovative products. 		
Course Outcomes:		
On completion of the course, the students will be able to		
CO1. To compare and classify the various learning styles and memory techniques and apply them in their engineering education.		
CO2. To analyze emotional experience and inspect emotional expressions to better understand users while designing innovative products.		
CO3. To develop new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products.		
CO4. To explore real-time innovative engineering product designs and choose appropriate frameworks, strategies, techniques during prototype development.		
CO5. To perceive individual differences, its impact on everyday decisions and create a better customer experience.		
Pedagogy: Lectures, Assignment		
Unit I: AN INSIGHT TO LEARNING		9 Hrs
Understanding the Learning Process - Kolb's Learning Styles - Assessing and Interpreting - Remembering Memory: Understanding the Memory process, Problems in retention - Memory enhancement techniques - Emotions - Experience and Expression - Understanding Emotions - Experience and Expression –Assessing Empathy, Application with Peers.		
Unit II: BASICS OF DESIGN THINKING		9 Hrs
Definition of Design Thinking - Need for Design Thinking - Objective of Design Thinking - Concepts and Brainstorming - Stages of Design Thinking Process (explain with examples) – Empathize - Define - Ideate - Prototype - Test. Being Ingenious and Fixing Problem - Understanding Creative thinking process - Understanding Problem Solving - Testing Creative Problem Solving.		
Unit III: PROCESS OF PRODUCT DESIGN		9 Hrs
Process of Engineering Product Design - Design Thinking Approach – Stages of Product Design - Examples of best product designs and functions - Assignment – Engineering Product – Design Prototyping and Testing- Rapid Prototype Development process - Testing - Sample Example, Test Group Marketing.		
Unit IV: CELEBRATING THE DIFFERENCE		9 Hrs
Understanding Individual differences and Uniqueness - Group Discussion and Activities to encourage the understanding - acceptance and appreciation of Individual differences. Design Thinking and Customer Centricity - Practical Examples of Customer Challenges - Use of Design Thinking to Enhance Customer Experience - Parameters of Product experience - Alignment of Customer Expectations with Product Design.		
Unit V: FEEDBACK, RE-DESIGN AND RE-CREATE		9 Hrs
Feedback loop - Focus on User Experience - Address ergonomic challenges - user focused design - rapid prototyping and testing - final product - final Presentation - Solving Practical Engineering Problem through Innovative Product Design and Creative Solution.		

Text Books:

1. **1. Burgelman, Christensen, and Wheelwright, “Strategic Management of Technology and Innovation”, 5 thEdition, McGraw Hill Publications, 2017.**
2. **Idris Mootee, “Design Thinking for Strategic Innovation: What They Can’t Teach You at Business or Design School”, John Wiley & Sons, 2013.**
3. E Balaguruswamy, “Developing Thinking Skills (The way to Success)”, Khanna Book Publishing Company, 2022.
4. Hasso Plattner, Christoph Meinel and Larry Leifer , “Design Thinking: Understand –Improve– Apply”, Springer, 2011.
5. Jeanne Liedtka, Andrew King and Kevin Bennett, “Book - Solving Problems with Design Thinking - Ten Stories of What Works”, Columbia Business School Publishing, 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											3		
CO2		3	2							2			3	2	
CO3		3	3	2	3				2		2		2	3	
CO4		3	3	3	2		2				2	3		3	3
CO5		3	3	3			3	3			3	2			3
AVE	3	2.8	2.8	2.7	2.5	-	2.5	3	2	2	2.3	2.5	2.7	2.7	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 116	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	FUNDAMENTALS OF DIGITAL ELECTRONICS	Multidiscipline
Course Objectives:		
<ol style="list-style-type: none"> 1. To understand the binary number system and design a combinational logic circuit 2. To design and implementations of the digital sequential circuits and various kinds of registers 		
Course Outcome:		
On completion of the course, the students will able to:		
CO1. Under the number system and logic gates.		
CO2. Elucidate the electronic components and able to apply in rectifier and amplifiers circuits.		
CO3. Analyze and construct the combinational and sequential logic circuits.		
CO4. Classify the memory elements and array.		
CO5. Design circuits using VLSI		
Pedagogy: Lecture and Hands-on simulation		
Unit I: Number System and logic gates		9 Hrs
Introduction to Binary Numbers, Data Representation, Binary, Octal, Hexadecimal and Decimal Number System and their Conversion. Boolean Algebra and Logic Gates: Basic Logic Operation and Identities- Gates, Useful Boolean Identities, Algebraic Reduction, Complete Logic Sets, Arithmetic Operation - Introduction to logic families		
Unit: II: Combinational Logic Design		9 Hrs
Specifying the Problem, Canonical Logic Forms, Extracting Canonical Forms, EX-OR Equivalence Operations, Logic Array, K-Maps: Two, Three and Four variable K-maps, NAND and NOR Logic Implementations, Concept of Digital Components, An Equality Detector, Line Decoder, Multiplexers and Demultiplexers, Code converters, Binary Adders, Subtraction and Multiplication		
Unit III: Sequential Network		9 Hrs
Concepts of Sequential Networks, Latches, Flip Flops, Analysis of Sequential Networks: Single State and Multi-variable Networks, Sequential Network Design, Binary Counters and Shift Registers, Importance of state machine.		
Unit IV: Memory Elements and Arrays		9 Hrs
General Properties, Latches, Flip Flops: RS Flip Flop, D Flip Flop, T Flip Flop, JK Flip Flop, Clock and Synchronization, Master-Slave and Edge-triggered Flip-flops, Registers, RAM and ROMs: different types, Programmable logic array, C-MOS Memories. Sample and Hold circuits, Analog to Digital Converters and Digital to Analog Converters.		
Unit V: Introduction to VLSI design		9 Hrs
Basic gate design - Digital VLSI design - Design of general boolean circuits using CMOS gates - Verilog Concepts - Basic concepts - Modules & ports & Functions - useful modelling techniques - Timing and delays - user defined primitives - Modelling Techniques.		
Text and Reference Books:		
<ol style="list-style-type: none"> 1. M. Morris Mano , Digital Logic and Computer Design by 11th Edition, Pearson Education, 2009 2. Malvino, A.P. and Leach, D.P., Digital Principles and Applications, 6th Ed., Tata McGraw-Hill. 2008. 		

3. Thomas L. Floyd, Digital Fundamentals, Tenth Edition, Pearson Education, NewDelhi, 2009.
4. Samir Palnitkar, Verilog HDL, Second Edition, Pearson Education, 2003.
5. Ronald J Tocci, Neal S Wisdmer and Gregory L. Moss, Digital Systems: Principle and Applications, 10th Edition, Pearson Education, 2011

S.No.	List of Indicative Experiments	Hours
1	Simplify the given Boolean expression and verify using logic gates/Universal gates	3 hours
2	Design and verification of Half-Subtractor and Full-Subtractor using logic gates	3 hours
3	Design and implementation of code converters	3 hours
4	Design and implementation of magnitude comparators using logic gates/ICs	3 hours
5	Design and verification of given logic function using multiplexer ICs	3 hours
6	Design and verification of latches	3 hours
7	Perform the logic operations using Verilog operators	3 hours
8	Design and verification of Half-adder and Full adder using Verilog structural modelling	3 hours
9	Design and verification of shift registers using Verilog HDL	3 hours
10	Design of arithmetic circuits using Verilog HDL	3 hours
Total Laboratory Hours		30 hours

CO-PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	-	-	-	-	-	-	-	2	2	3
CO2	3	2	2	2	2	-	-	-	-	-	-	-	2	2	3
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	3	3
CO4	3	2	2	2	2	-	-	-	-	-	-	-	3	3	3
CO5	2	2	2	2	2	-	-	-	-	-	-	-	3	3	3
Avg	2.6	2	2	2	2	-	-	-	-	-	-	-	2.6	2.6	3

Subject Code ENAE 111	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	ENGLISH-I	<i>Ability Enhancement</i>
<p>Course Objectives:</p> <p>1. Build the competence in English grammar and vocabulary for effective communication by developing Reading, Writing, Listening and Speaking skills of students.</p>		
<p>Course Outcomes:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. To enhance communication skillsthrough formal and informal mode.</p> <p>CO2. To apply the technical writing and communication skillsin their academic and professional life.</p> <p>CO3. To gain self-confidence with improved command over English.</p> <p>CO4. To understand the technical aspects of communication for better performance in extracurricular activities, recruitment process and prospective jobs.</p> <p>CO5. To develop and deliver professional presentations.</p>		
<p>Pedagogy: Lectures , Assignment</p>		
<p>Unit I: FUNDAMENTALS OF COMMUNICATION SKILLS</p> <p>Importance of communication through English – Process of communication and factors that influence speaking - Importance of audience and purpose - Principles of communication - comparing general communication and business communication - Professional communication - barriers to communication - strategies to overcome communication barriers - formal and informal communication.</p>		9 Hrs
<p>Unit II: WRITING SKILLS</p> <p>Basics of Grammar - Placing of Subject and Verb - Sentence Structures - Use of Phrases and Clauses in sentences - Importance of proper punctuation - Creating coherence - Techniques for writing precisely - Parts of Speech - Uses of Tenses - Active and Passive - Modes of Writing.</p>		9 Hrs
<p>Unit III: VOCABULARY BUILDING AND WRITING</p> <p>The Concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance with prefixes and suffixes - Synonyms & Antonyms -Words often confused - One-word substitutes - Idioms and Phrasal Verbs - Abbreviations of Scientific and Technical Words</p>		9 Hrs
<p>Unit IV: SPEAKING SKILLS</p> <p>Introduction to Phonetic Sounds & Articulation - Word Accent - Rhythm and Intonation - Interpersonal Communication - Oral Presentation - Body Language and Voice Modulation (Para linguistics and NonVerbal) - Negotiation and Persuasion - Group Discussion - Interview Techniques (Telephonic and Video Conferencing).</p>		9 Hrs
<p>Unit V: TECHNICAL WRITING</p> <p>Job Application - CV Writing - Business Letters - Memos - Minutes - Notices – Report Writing Structures - E-mail Etiquette - Blog Writing</p>		9 Hrs
<p>Text Books:</p> <ol style="list-style-type: none"> Ludlow R. and Panton F., “The Essence of Effective Communication”, Prentice Hall, 2020. Kul Bhushan Kumar & R. S. Salaria, “Effective Communication Skills”, Khanna Publishing House, 2018. Dr. Bikram K. Das et al., “An Introduction to Profession English and Soft Skills”, Cambridge University Press, 2009. Michael Mccarthy and Felicity O Dell, “English Vocabulary in Use”, McCarthy M, Cambridge University Press, 3rd Edition, 2017. Raman M. Sharma S, “Technical Communication: Principles and Practice”, Raman, Oxford University Press, 2nd Edition, 2012. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	2	2	-	-	-	-	2	2	2	2
CO2	3	2	-	-	-	2	2	-	-	-	-	2	2	2	2
CO3	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
CO4	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
Avg	2.8	2	-	-	-	2	2	-	-	-	-	2	2.6	2.6	2.6

Subject Code BTCB 117	Subject Title	L T P C 2 0 4 0
<i>Technical</i>	IDEA LAB WORKSHOP	<i>Value Added</i>
Course Objectives:		
1. To learn skill tools and inventory associated with the IDEA Lab. 2. To build useful standalone system/ project with Mechanical and Electronic fabrication process.		
Course Outcomes:		
On completion of the course, the students will be able to CO1. To understand the working of tools and inventory associated with the IDEA lab CO2. To understand the working of mechanical and electronic fabrication processes. CO3. To design the standalone project and report preparation.		
Pedagogy: Lectures , Lab exercises, Assignment		
Unit I: Designing and Introduction to Hand and Power Tools		9 Hrs
Electronic component familiarization, electronic system design flow. Schematic design and PCB layout and Gerber creation using Eagle CAD. Documentation: Doxygen, Google Docs, overleaf. Version control tools - GIT and GitHub. Basic 2D and 3D designing using CAD tools: FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace, OpenBSP and VeriCUT. Introduction to basic hand tools: Tape measure, combination square, Vernier caliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading. Adhesives Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools. Various types of drill bits.		
Unit II: Circuit Prototyping And Mechanical Cutting And Joining Process		9 Hrs
Familiarization and use of basic measurement instruments - DSO including various triggering modes, DSO probes, DMM, LCR bridge, Signal and function generator. Logic analyzer and MSO. Bench power supply (with 4-wire output) Circuit prototyping - breadboard, Zero PCB, Manhattan' style, custom PCB. Single, double and multilayer PCBs. Single and double-sided PCB prototype fabrication in the lab. Soldering using soldering iron/station. Soldering using a temperature controlled reflow oven. Automated circuit assembly and soldering using pick and place machines. Mechanical cutting processes - 3-axis CNC routing, basic turning, milling, drilling and grinding operations, Laser cutting, Laser engraving etc. Basic welding and brazing and other joining techniques for assembly. Concept of Lab aboard a Box.		
Unit III: ELECTRONIC CIRCUIT BUILDING AND 3D PRINTING		9 Hrs
Electronic circuit building blocks including common sensors. Arduino and Raspberry Pi programming and use. Digital Input and output. Measuring time and events. PWM. Serial communication. Analog input. Interrupts programming. Power Supply design (Linear and Switching types), Wireless power supply, USB PD, Solar panels, Battery types and charging. 3D printing and prototyping technology –3D printing using FDM, SLS and SLA. Basics of 3D scanning, point cloud data generation for reverse engineering. Prototyping using subtractive cutting processes. 2D and 3D Structures for prototype building using Laser cutter and CNC routers. Basics of IPR and patents; Accessing and utilizing patent information in IDEA Lab.		
Unit IV: Mini Project		9 Hrs
Discussion and implementation of a mini project.		
Unit V: Report Preparation		9 Hrs
Documentation of the mini project (Report and video).		
Text Books:		
1. Chris Hackett, Weldon Owen, “The Big Book of Maker Skills: Tools and Techniques for Building Great Tech Projects”, 2018.		

2. Sean Michael Ragan, Weldon Owen “The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product”, 2017.

3. Paul Horowitz and Winfield Hill, “The Art of Electronics”, Cambridge University Press, 3rd Edition. R. G.Dromey, how to solve it by Computer, PHI, 2008.

3. Paul Sherz and Simon Monk. “Practical Electronics for Inventors” McGraw Hill, 4 thEdition, 2016.

4. Charles Platt, “Encyclopedia of Electronic Components (Volume 1,2 and 3)”, Shroff Publishers, 2012.

5. John H. Moore, Christopher C. Davis, Michael A. Coplan and Sandra C. Greer, “Building Scientific Apparatus”,Cambridge University Press, 4 th Edition, 2009.

6. Simon Monk “Programming Arduino: Getting Started with Sketches”, McGraw Hill, 2 ndEdition, 2016.

S.No.	List of Indicative Experiments	Hours
1	Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.	3 hours
2	Machining of 3D geometry on soft material such as soft wood or Modelling wax.	3 hours
3	3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer	3 hours
4	2D profile cutting of press fit box/casing in acrylic (3 or 6 mm Thickness)/cardboard, MDF (2 mm) board using laser cutter and engraver.	4 hours
5	2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.	3 hours
6	Familiarity and use of welding equipment.	3 hours
7	Familiarity and use of normal and wood lathe.	3 hours
8	Embedded programming using Arduino and/or Raspberry Pi.	4 hours
9	Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.	4 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	-	-	2	-	3	2	-	-	-
CO2	3	3	3	2	2	2	-	-	2	-	3	2	-	-	-
CO3	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-
CO4	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-
CO5	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-
Avg	3	2.8	2.8	2	2.6	2	-	-	2-	-	3	2	-	-	-

SEMETER II

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 121	Computer Programming using Python with lab	3-0-2-4
BTCB 122	Principles of Economics	3-0-0-3
BTCB 123	Fundamentals of Business Accounting	3-0-0-3
BTCB 124	Applied Linear Algebra	3-0-0-3
BTCB 125	IT Workshop (Sci lab/MATLAB) with lab	1-0-4-3
BTCB 126	Universal Human Values-II	2-1-0-3
BTCB 127	Business Communication	3-0-0-3
BTCB 128	Sports and Yoga (Non-Credit)	2-0-0-0
BTCB 129	Modern Indian Languages	3-0-0-3
Total Credits		25

After 1st Year Exit: Internship during summer (Exit Requirement: 4 Credits for Skill & 6 Credits for Internship): **10 Credits**

NEP PU Guidelines

- ❖ Students exiting the programme after securing 40 credits will be awarded UG Certificate in the relevant Discipline/Subject provided they secure 4 credits in work based vocational courses offered during summer term or internship / Apprenticeship in addition to 6 credits from skill-based courses earned during first and second semester.
- ❖ UG Certificate can be offered in multiple streams pertaining to the major discipline – eg. In the discipline of Commerce, certificates may be offered in Accounting, Taxation and Auditing and so on as separate streams.
- ❖ The student decides either to continue with the chosen major or request a change of major at the end of 2nd semester.
- ❖ The student declares the choice of minors and vocational stream related to the minor at the end of second semester after exploring various courses.

(The minor stream courses include vocational courses which will help the students to equip with job-oriented skills.)

Subject Code BTCB 121	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	COMPUTER PROGRAMMING USING PYTHON WITH LAB	<i>Multidiscipline</i>
Course Objectives:		
1. To understand basic problem-solving techniques using Python Programming Language 2. To develop the logical thinking abilities and to propose innovative solutions for real world problems through programming language constructs.		
Course Outcome:		
On completion of the course, the students will be able to: CO1: Interpret the basic representation of the data structures, sequential programming, control framework, and functions. CO2: Apply core data structures to handle data and to implement solutions using reusable modules. CO3: Examine string manipulation techniques and regular expressions for searching problems CO4: Demonstrate the applicability of basic functional constructs and recursive Functions CO5: Develop real-time applications.		
Pedagogy: Lectures, Assignments, Practice.		
UNIT I: INTRODUCTION		9 Hrs
Python Installation - Managing Projects - Python IDE - Demo of Interactive and script mode - Running Python Programs -Tokens in Python – Variables, Keywords, Comments, Literals, Data types, Indentation, Operators and its precedence, Expressions, Input and Print functions. Packages, Sequential and Object-oriented approach.		
UNIT II: CONTROL STRUCTURES AND COLLECTIONS		12 Hrs
Selective statements – if, if-else, nested if, if –elif ladder statements- Iterative statements - while, for, Nested loops, else in loops, break, continue and pass statements. List: Create, Access, Slicing, Negative Indices, List Methods, and comprehensions. Tuples: Create, Indexing and Slicing, Operations on tuples. Dictionary: Create, add, and replace values, operations on dictionaries. Sets: Create and operations on set.		
UNIT III: STRINGS AND REGULAR EXPRESSIONS		8 Hrs
Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Negative indices, String functions. Regular expression: Matching the patterns, Search and replace.		
UNIT IV: FUNCTIONS		8 Hrs
Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Using NumPy Package-Recursion and Lambda functions.		
UNIT V: FILE HANDLING AND EXCEPTION HANDLING		8 Hrs
Files: Open, Read, Write, Append and Close. Tell and seek methods. Using PANDAS Package Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User-defined Exceptions, Defining Clean-Up actions.		
Text Books:		

1. **Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, No starch Press, 2019.**
2. **Martie C Brown, Python: The Complete Reference, 4th Edition, McGraw Hill Publishers,2018.**
3. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem Solving Focus, Second Edition, Wiley India Edition, 2017.
4. Allen D. Downey Think Python: How to Think Like a Computer Scientist, Third Edition, O'Reilly Publications, 2016.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	2	2						2	2	2	2
CO2	2	2	3	2	2	2						2	2	2	3
CO3	2	2	3	3	2	2						3	3	2	2
CO4	3	3	3	3	2	3						3	3	3	3
CO5	3	3	3	2	3	3						3	3	3	3
Avg	2.4	2.6	2.8	2.4	2.2	2.4						2.6	2.6	2.4	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 122	Subject Title	L T P C 3 0 0 3
Technical	PRINCIPLES OF ECONOMICS	Minor
Course Objectives:		
<ol style="list-style-type: none"> To impart economic theories and principles. To assess the applicability of economic principles and theories in business 		
Course Outcome:		
On completion of the course, the students will able to:		
CO1. Understand basic economic theories and principles		
CO2. Apply and analyse theories of demand and supply		
CO3. Analyse and illustrate the key concepts of production and cost analysis.		
CO4. Demonstrate and apply the knowledge of market structure and firm behaviour		
CO5. Understand macroeconomic fundamentals		
Pedagogy: Lectures, Case, Seminar, Discussion		
UNIT I: INTRODUCTION		7 Hrs
Origin of economics-Mankiw Principles of Economics- Working of Economy-Objectives of firm-Economics as Science- Role of assumptions-Separation of ownership and control-Economics of information-Adverse Selection-Moral hazards		
UNIT II: DEMAND & SUPPLY		12 Hrs
Theory of Demand-Market demand versus individual demand -Demand Curve-Shift in Demand- Theory of Supply- Market supply versus individual supply -Supply Curve-Shift in Supply-Market equilibrium- Elasticity and its application -Price, income, cross elasticity. Theory of consumer behaviour-Indifference Curves-Utility Maximization		
UNIT III: PRODUCTION AND COST ANALYSIS		12 Hrs
Production Function-Cost output relations -Cost of production -Production and costs-Production in short and long run -Cost in short and long run- Isoquants-Law of returns -Law of variable proportion-Economies of scale		
UNIT IV: ANALYSIS OF MARKET STRUCTURE		6 Hrs
Different market structures-Firms in competitive markets-Monopoly-Monopolistic Competition-Oligopoly-Profit maximization in different market structure-Pricing practices-Methods and strategies of price determination-Market failure.		
UNIT V: MACROECONOMICS BASICS		6 Hrs
Aggregate demand and supply- National income- Money and inflation-Theory of money-Business cycles- IS and IM curve-Monetary and fiscal policies.		
Text Books:		
<ol style="list-style-type: none"> Mankiw, N. Gregory. "Principles of Macroeconomics, 8e." (2018). Thomas, Christopher R., S. Charles Maurice, and Sumit Sarkar. Managerial economics. McGraw-Hill/Irwin, 2005. Mankiw, N. Gregory. Brief principles of macroeconomics. Cengage Learning, 2018. Keat, Paul G., and Philip KY Young. Managerial Economics, Global Edition. Pearson Education UK, 2013. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	1	-	1	1	-	-	-	2	2	3	2	1
CO2	2	1	-	1	-	1	1	-	-	-	2	2	3	2	1
CO3	3	3	-	2	-	1	2	-	-	-	3	2	3	2	1
CO4	3	3	-	3	-	1	2	-	-	-	3	2	3	2	1
CO5	3	3	-	3	-	1	2	-	-	-	3	2	3	2	1
Ave	2.8	2.2	-	2	-	1	1.6	-	-	-	2.6	2	3	2	1

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 123	Subject Title	L T P C 3-0-0-3
<i>Cognitive</i>	FUNDAMENTALS OF BUSINESS ACCOUNTING	<i>Multidiscipline</i>
<i>Learning Objectives:</i>		
1. To introduce students to the fundamental principles and practices of accounting, enabling them to understand and apply accounting concepts in business decision-making. 2. To equip students with the skills to record, classify, and summarize financial transactions, culminating in the preparation of financial statements for different types of organizations		
<i>Learning Outcome:</i>		
On completion of the course, the students will able to: CO1. Identify and recall basic accounting concepts, conventions, and systems used in recording and reporting financial transactions CO2. Explain the double-entry system, accounting equations, and the steps involved in the preparation of final accounts for businesses CO3. Apply accounting rules and principles to record business transactions and prepare financial statements for sole proprietorships, companies, and government entities. CO4. Analyse financial statements and transactions to detect errors and apply rectification techniques to ensure the accuracy of accounting records CO5. Evaluate different accounting standards (Ind-AS, GAAP, IFRS) and their applications in corporate and governmental accounting practices, assessing their impact on financial reporting		
<i>Pedagogy: Lectures, Practical, Seminars, Assignments, Quiz, Project, Case Study</i>		
Unit I: Accounting and Economic Decisions		7 Hrs
Understanding Business Organisation – Accounting – Accounting Information system - Users of Accounting Information – Types of Accounting – Systems of Accounting – Accounting Concepts and Conventions – Book-Keeping vs Accounting – Accounting Equations.		
Unit II: Recording Business Transactions		9 Hrs
Double Entry system of Accounting – Rules of Accounting - Journal Entry – Subsidiary Book - Ledger Account – Trial Balance preparation – Errors and Rectification of Errors – Revenue and Capital Expenditure – Fixed Assets – Depreciation Accounting – Bills of Exchange.		
Unit III: Measuring Business Income		10 Hrs
Preparation of Final Accounts (Traditional ‘T’ Form) – Preparation of Financial Statements (New Vertical Format) – Closing Entries - Preparation of Final Account with adjustments.		
Unit IV: Corporate Accounts		10 Hrs
Companies account - Share capital – Entries for Share capital – Final account preparation for Companies – Preparation of Banking Company Accounts – Preparation of Insurance Company Accounts – Government Accounts Human Resource Accounting and Environmental Accounting.		
Unit V: Accounting Standards		9 Hrs
Accounting standard(Ind-AS)-Generally Accepted Accounting Principles(GAAP)- International Financial- Reporting Standards(IFRS)- eXtensible Business Reporting		

Language(XBRL).Computerised Accounting–Terms used in Computerised Accounting– Accounting Software– ERP Accounting –Core Banking Software and its components.

Text Books:

1. R.Narayanaswamy ‘Financial Accounting’, PHI, New Delhi
2. T.S.Grewal – Introduction to Accountancy- S.Chand & Company Ltd.,
3. K.L.Narang, S.N.Maheswari - Advanced Accountancy, Kalyani publishers
4. S.K.Maheswari, T.S.Reddy - Advanced Accountancy, Vikas publishers
5. A.Murthy -Financial Accounting, Margham Publishers

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Ave	3	3	3	2.8	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 124	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	APPLIED LINEAR ALGEBRA	<i>Multidiscipline</i>
Course Objectives:		
<ol style="list-style-type: none"> To learn the properties of linear transformations and linear system of equations To impart knowledge on linear algebra and its applications in engineering and business 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Understand vector spaces, linear transformations, vectors and eigenvalues		
CO2. Formulate linear equations for real life problems and solve them		
CO3. Represent linear transformations using matrices		
CO4. Apply linear algebra techniques in diverse fields		
CO5. Develop problem-solving skills to resolve real-world engineering problems.		
Pedagogy: <i>Lecture, Assignment, tutorial</i>		
Unit I: VECTOR SPACES		9 hrs
Vector spaces – Subspaces – Linear combinations and linear system of equations. Linear independence and Linear dependence – Basis and Dimension		
Unit II: LINEAR TRANSFORMATIONS		9 hrs
Linear Transformation – Null space, Range space - Dimension theorem - Matrix representations of Linear Transformations. Eigenvalues and Eigenvectors of a linear transformation – Diagonalization of linear transformations – Application of diagonalization in a linear system of differential equations.		
Unit III: ORTHOGONAL VECTORS		9 hrs
Inner Product Spaces – Norms - Orthogonal vectors – Gram Schmidt orthogonalization process – Least Square Approximations		
Unit IV: LINEAR SYSTEM OF EQUATIONS		9 hrs
Solution of linear system of equations – Direct method: Gauss elimination method – Pivoting – Gauss Jordan method -LU decomposition method – Cholesky decomposition method Iterative methods: Gauss-Jacobi and Gauss-Seidel – SOR Method		
Unit V: EIGENVALUE PROBLEMS		9 hrs
Eigenvalue Problems: Power method – Inverse Power method - Jacobi’s rotation method Generalized Inverses QR decomposition - Singular Value Decomposition method		
Text Books:		
<ol style="list-style-type: none"> Stephen H. Friedberg, Insel A.J. and Spence L.E., “Linear Algebra”, 4th. Edition, Prentice - Hall of India, New Delhi, 2003. M.K.Jain, S.R.K.Iyengar, R.K.Jain, “Numerical Methods for Scientific and Engineering Computation”, New Age International (P) Limited, New Delhi, 2003. Strang G., “Linear Algebra and its Applications”, Thomson (Brooks/Cole), New Delhi, 2005. Kumaresan. S., “Linear Algebra – A Geometric Approach”, PHI, New Delhi, 2010. Faires J.D. and Burden R., “Numerical Methods”, Brooks/Cole (Thomson Publications), New Delhi, 2002. 		

CO-PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1				1				3	2	2
CO2	3	3	2	3	2		2						2	2	2
CO3	3	3	3	2	3					1			2	2	2
CO4	3	3	2	3	2		2						3	3	1
CO5	3	3	3	3	3		2		1	2	2		3	2	3
Avg	3	3	2.4	2.6	2.2		2		1	1.5	2		2.6	2.2	2
	<i>S-Strong (3)</i>			<i>M- Medium (2)</i>				<i>L- Low (1)</i>							

Subject Code BTCB 125	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	IT WORKSHOP (SCILAB/MATLAB) WITH LAB	<i>Skill Course</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. To introduce fundamentals of data analysis, modelling, visualization using Scilab/Matlab 2. To provide hands-on-experience in Scilab/Matlab software to solve simple problems in engineering/business domain 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the MATLAB environment and basic commands</p> <p>CO2. Develop basic algorithms in MATLAB for numerical computations and problem-solving.</p> <p>CO3. Apply MATLAB to visualize data and graphs, including 2D and 3D plotting</p> <p>CO4. Develop scripts and functions for modular programming in MATLAB,</p> <p>CO5. Demonstrate the ability to work independent/collaborative on MATLAB-based projects</p>		
<p>Pedagogy: Lecture, Practical, Assignment</p>		
<p>Unit I: INTRODUCTION TO MATLAB SOFTWARE AND MATLAB SUITE:</p> <p>Working with M-Files, Simulation Files, Functions and Scripts</p>		9hrs
<p>Unit II: MATH FUNCTIONS, ORDER, VARIABLES</p> <p>Work with Mathematics in Matlab – Arithmetic functions, Order of operations, Order of precedence, pi and exponential, symbolic toolbox. Create, Define, and use variables in Matlab. Trigonometric Functions in Matlab Complex Numbers in Matlab</p>		9hrs
<p>Unit III: VECTORS IN MATLAB</p> <p>Vectors in Matlab - Dot and Cross Products, Statistics on Vectors, Create Vectors, Extract and Manipulate data, Element by Element operation on vectors, Random Vectors, Statistical Analysis.</p>		9hrs
<p>Unit IV: MATRICES</p> <p>Matrices – Extract data from a Matrix, Multiplication, Find max, min, number of elements in Matrix, Augment a matrix, Transpose and Diagonal Matrices, Solve equations using Matrices, Trace, Inverse and other features.</p>		9hrs
<p>Unit V: VISUALIZATION</p> <p>Calculus and Engineering Functions – Differentiation, Integration, Limit Function, Partial Derivatives for any function. Graphs and Plots.</p>		9hrs
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Sulaymon Eshkabilov, Beginning Matlab and Simulink, Apress Publishers, 2022, Second Edition. 2. Jose Miguel David Baez-Lopez, David Alfredo Baez Villegas, MATLAB Handbook with Applications to Mathematics, Science, Engineering, and Finance, CRC Press, 2019 		

INDICATIVE LAB EXERCISES:

1. Introduction to MATLAB Environment: <ul style="list-style-type: none">○ Write a script to demonstrate basic arithmetic operations.○ Create a script that shows the use of MATLAB variables and data types (integers, floating-point numbers, strings, etc.).	2hrs
2. Matrix Operations: <ul style="list-style-type: none">○ Create a program to add, subtract, and multiply two matrices.○ Write a program to calculate the transpose, determinant, and inverse of a matrix.	2hrs
3. Plotting and Visualization: <ul style="list-style-type: none">○ Write a script to plot a sine and cosine wave on the same graph with different line styles and labels.○ Create a 3D surface plot of a mathematical function (e.g., $z = x^2 + y^2$).	2hrs
4. Control Flow and Loops: <ul style="list-style-type: none">○ Write a program that prints the Fibonacci series up to a specified number using a loop.○ Create a program to find the sum of all even numbers from 1 to 100 using a for loop.	2hrs
5. Conditional Statements: <ul style="list-style-type: none">○ Write a program to check if a given number is prime or not using if-else conditions.○ Create a script that categorizes a given set of students' grades (A, B, C, D, F) based on their scores.	2hrs
6. Functions: <ul style="list-style-type: none">○ Write a function to compute the factorial of a number.○ Develop a function that calculates the roots of a quadratic equation using the quadratic formula.	2hrs
7. Working with Vectors and Arrays: <ul style="list-style-type: none">○ Create a program to compute the dot product and cross product of two vectors.○ Write a script that finds the mean, median, and standard deviation of a dataset stored in an array.	3hrs
8. File Input/Output: <ul style="list-style-type: none">○ Write a program to read data from a text file and plot the values.○ Create a script that saves generated data (e.g., random numbers or function values) to a file.	3hrs
9. Solving Systems of Equations: <ul style="list-style-type: none">○ Develop a program to solve a system of linear equations using matrix operations.○ Write a function that uses fsolve to find the solution of a non-linear system of equations.	3hrs
10. Numerical Methods: <ul style="list-style-type: none">○ Implement the Bisection Method to find the root of a non-linear equation.○ Write a script to approximate the value of an integral using the Trapezoidal Rule.	3hrs

11. Data Visualization: <ul style="list-style-type: none"> ○ Write a program to plot multiple subplots in one figure, showing different mathematical functions. ○ Create a program to generate a histogram and pie chart of random data. 	3hrs
12. Polynomials: <ul style="list-style-type: none"> ○ Write a script to find the roots of a polynomial equation using MATLAB's built-in roots function. ○ Develop a program to fit a polynomial to a set of data points and plot the original data and the fitted curve. 	3hrs
Total	30hrs

CO-PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	2	1		3					1			3	2	3
C02	3	3	2	2	3				1	1	1	2	2	2	2
C03	2	2	3	3	3					1			2	2	2
C04	3	2	3	3	3				1	1		2	3	1	1
C05	2	2	2	2	3				3	2	2	3	1	3	2
Avg	2.6	2.2	2.2	2.5	3.0				1.7	1.2	1.5	2.3	2.2	2.0	2.0

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 126	Subject Title	L T P C 2 1 0 3
<i>Cognitive</i>	UNIVERSAL HUMAN VALUES-II	<i>Value Added</i>
Course Objectives:		
1. To highlight the plausible implications of such a holistic understanding in terms of ethical human conduct, trustful, mutually fulfilling human behaviour and mutually enriching interaction with Nature.		
Course Outcomes:		
On completion of the course, the students will be able to		
CO1. Evaluate the significance of value inputs in formal education and start applying them in their life and profession.		
CO2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.		
CO3. Analyze the value of harmonious relationship based on trust and respect in their life and profession.		
CO4. Examine the role of a human being in ensuring harmony in society and nature.		
CO5. Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.		
Pedagogy: Lectures, Presentations, report writing, role play.		
Unit I: INTRODUCTION TO VALUE EDUCATION		9 Hrs
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity the Basic Human Aspirations, Happiness and Prosperity Current Scenario, Method to Fulfil the Basic Human Aspirations.		
Unit II: HARMONY IN THE HUMAN BEING		9 Hrs
Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.		
Unit III: HARMONY IN THE FAMILY AND SOCIETY		9 Hrs
Harmony in the Family, the Basic Unit of Human Interaction, Trust, Foundational Value in Relationship, Respect, Right Evaluation, Other Feelings, Justice in Human to Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.		
Unit IV: HARMONY IN THE NATURE/EXISTENCE		9 Hrs
Understanding Harmony in the Nature, Interconnectedness, selfregulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion.		
Unit V: IMPLICATIONS OF THE HOLISTIC UNDERSTANDING		9 Hrs
Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.		
Text Books:		

1. Premvir Kapoor, “Professional Ethics and Human Values”, Khanna Book Publishing Company, New Delhi, 2022.
2. R R Gaur, R Asthana, G P Bagaria, “The Textbook - A Foundation Course in Human Values and Professional Ethics”, Excel Books, New Delhi, 2nd Revised Edition, 2019.
3. RR Gaur, R Asthana, G P Bagaria, “The Teacher’s Manual- Teachers Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, 2019.
4. Annie Leonard, “The Story of Stuff”, 2011.
5. A.N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.
6. Mohandas Karamchand Gandhi, “The Story of My Experiments with Truth”, FP classic, 2009.
7. A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, “Van Vidya: Ek Parichaya”, 1999.

CO-PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-
C02	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-
C03	-	-	-	-	-	3	3	2	2	-	-	3	-	-	-
C04	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-
C05	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-
Avg	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 127	Subject Title	L T P C 2 0 0 0
<i>Cognitive</i>	SPORTS AND YOGA	<i>Value Added</i>
Course Objectives:		
1. To expose the students in variety of physical, yogic activities and stimulating their continued inquiry about Yoga, physical education, health and fitness.		
Course Outcomes:		
On completion of the course, the students will be able to		
CO1. To practice physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.		
CO2. To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.		
CO3. To learn breathing exercises and healthy fitness activities.		
CO4. To understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.		
CO5. To perform yoga movements in various combination and forms.		
Pedagogy: Lectures, Presentations, report writing, role play.		
Unit I:		9 Hrs
Introduction to Physical Education - Olympic Movement - Physical Fitness - Wellness and Lifestyle.		
Unit II:		9 Hrs
Fundamentals of Anatomy & Physiology in Physical Education - Sports and Yoga - Kinesiology - Biomechanics & Sports		
Unit III:		9 Hrs
Postures- Yoga - Yoga & Lifestyle		
Unit IV:		9 Hrs
Training and Planning in Sports - Psychology & Sports - Doping		
Unit V:		9 Hrs
Sports Medicine - Sports/Games		
Text Books:		
1. Dr. Sudhakara.G, “Modern Trends in Physical Education, Sports and Yogic Science”, 2020.		
2. Swami Vivekananda, “PatanjaliÆs Yoga Sutras”, paperback, 2019.		
3. B.K.S. Iyengar, “Light On Yoga”, 2006.		
4. Health and Physical Education NCERT (11th and 12thClasses)		

Subject Code BTCB 128	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	BUSINESS COMMUNICATION	<i>Ability Enhancement</i>
Course Objectives:		
1. To enrich strong vocabulary and decoding skills through comprehension analysis 2. To explore the various workplace communication skills and technical report writing		
Course Outcomes:		
On completion of the course, the students will be able to CO1. Interpret meaning and apply reading strategies in technical and non-technical context CO2. Develop interpersonal communication skills professionally CO3. Infer the various business writing and ethics for professionals CO4. Demonstrate various forms of formal report writing CO5. Apply the techniques for Business case studies.		
Pedagogy: Lectures, Presentations, report writing, role play.		
Unit I: Introduction		9 Hrs
Communication model. - relevance and types of managerial communication – communication barriers – ethical communication -- Professionalism in communication – team communication, meetings, listening, Non-Verbal communication, Workplace diversity and cross cultural communication.		
Unit II: Planning Business messages		9 Hrs
Analyzing the task, anticipating the audience, adapting the message- organizing and writing business messages patterns of organisation – use of tools such as mind maps composing the message. Revising business messages- Revising for clarity, conciseness and readability- proof-reading and evaluating.		
Unit III: Workplace Communication		9 Hrs
Workplace communication – Electronic messages and digital media- use of audio visuals, presentation (MS-PowerPoint, flash, moviemaker) and communication (SKYPE) software- positive messages- negative messages structure and patterns in communicating news- persuasive messages Developing a sales pitch		
Unit IV: Workplace Communication Reports		9 Hrs
Business reports basics- Audience analysis and report organization researching and illustrating report data- informal business reports proposals and formal reports- Employment communication- Job search resumes and cover letters- Interview and follow-up- Business etiquettes.		
Unit V: Case Study		9 Hrs
Technical report for Business Case studies - Creative Project.		
Text Books:		
1. Oliu, Brusaw, and Alred., Writing That Works: Communicating Effectively on the Job, Bedford/St. Martin's publication, 2016. 2. John M. Lannon, Laura J. Gurak, Technical Communication, Pearson, 2016. 3. Laura Brown, Rich Karlgaard, The Only Business writing book you will ever read, Forbes India Publication, 2019. 4. Natalie Canavor, Business Writing Today, Sage Publication, 2018.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	2	-	2	-	3	-	2	2	2	3
CO2	2	2	2	-	-	2	-	2	-	3	-	2	2	2	3
CO3	2	2	2	-	-	2	-	2	-	3	-	2	2	2	3
CO4	2	2	2	-	-	2	-	2	-	3	-	2	2	2	3
CO5	2	2	2	-	-	2	-	2	-	3	-	2	2	2	3
Avg	2	2	2	-	-	2	-	2	-	3	-	2	2	2	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 129	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	MODERN INDIAN LANGUAGES	<i>Ability Enhancement</i>
<ul style="list-style-type: none"> • The Students can choose any one Indian Language subject from the Departments that offer language course in Pondicherry University. • The existing language courses are Tamil, Hindi, Sanskrit, etc., 		

SEMESTER III

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 231	Data Structures with Lab	3-0-2-4
BTCB 232	Database Management Systems with Lab	3-0-2-4
BTCB 233	Principles of Management	3-0-0-3
BTCB 234	Object Oriented Programming	3-0-0-3
BTCB 235	Microprocessor and Microcontroller	3-0-0-3
BTCB 236	Probability and Statistics	3-0-0-3
BTCB 237	Accounting Software Lab (Skill Course)	0-0-4-2
BTCB 238	Community Engagement and Service	0-0-4-2
Total Credits		24

Subject Code	Subject Title	L T P C
BTCB 231		3 0 2 4
<i>Technical</i>	DATA STRUCTURES WITH LAB	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> To impart the basic concepts of data structures and its terminologies. To understand concepts about stack and queue operations. 		
Course Outcomes:		
<p>On completion of the course, the students will be able to:</p> <p>CO1. Compute time and space complexity for given problems</p> <p>CO2. Demonstrate stack, queue and its operation.</p> <p>CO3. Illustrate the various operations of linked list.</p> <p>CO4. Use the concepts of tree for various applications.</p> <p>CO5. Outline the various sorting, hashing and graph techniques.</p>		
Pedagogy: Lecture, Assignments and Practical		
Unit I - BASIC TERMINOLOGIES OF DATA STRUCTURES		9 Hrs
Introduction: Basic Terminologies – Elementary Data Organizations. Data Structure Operations: Insertion – Deletion – Traversal. Analysis of an Algorithm. Asymptotic Notations. Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques – Complexity analysis.		
Unit II – STACK AND QUEUE OPERATIONS		9 Hrs
Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.		
Unit III- LINKED LIST OPERATIONS		9 Hrs
Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.		
Unit IV – TREES		9 Hrs
Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree. Introduction to B-Tree and B+ Tree.		
Unit V–SORTING, HASHING AND GRAPHS		9 Hrs
Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table – Hash Function and its characteristics. Graph: Basic Terminologies and Representations – Graph traversal algorithms.		
Text Books:		
<ol style="list-style-type: none"> Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Computer Science Press, Second Edition, 2018. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009. Mark A. Weiss. Data Structures and Algorithm Analysis in C++. India: Pearson Education, 2007. Kurt Mehlhorn, and Peter Sanders – Algorithms and Data Structures The Basic Toolbox, Springer- 		

Verlag Berlin Heidelberg, 2008.

6. Horowitz, Sahni, and S. Anderson-Freed , Fundamentals of Data Structures in C Universities press, Second Edition, 2008.

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.	3 hours
2	Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.	3 hours
3	Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT	3 hours
4	Write a C program to implement list ADT to perform following operations a) Insert an element into a list. b) Delete an element from list c) Search for a key element in list d) count number of nodes in list.	3 hours
5	Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.	3 hours
6	Write a C program to implement dequeue (double ended queue) ADT using a doubly linked list and an array.	3 hours
7	Write a C program to perform the following operations: a) Insert an element into a binary search tree. b) Delete an element from a binary search tree. c) Search for a key element in a binary search tree.	3 hours
8	Write a C program that use recursive functions to traverse the given binary tree in a) Preorder b) Inorder and c) Postorder.	3 hours
9	Write a C program to perform the AVL tree operations.	3 hours
10	Write a C program to implement Graph Traversal Techniques.	3 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
CO2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
CO3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
CO4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
CO5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
Avg	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 232	Subject Title	L T P C 3 0 2 4
Technical	DATABASE MANAGEMENT SYSTEMS WITH LAB	Major
Course Objectives:		
<ol style="list-style-type: none"> To gain knowledge about database concepts and query language. To acquaint the student with knowledge on data storage and transaction processing, concurrency control techniques and recovery procedures 		
Course Outcomes:		
<p>On completion of the course, the students will be able to</p> <p>CO1. Classify the modern and futuristic database applications based on size and complexity</p> <p>CO2. Analyze about ER model to Relational model to perform database design effectively</p> <p>CO3. Develop queries using normalization criteria and optimize queries</p> <p>CO4. Compare and contrast various indexing strategies in different database systems</p> <p>CO5. Appraise how advanced databases differ from traditional databases.</p>		
Pedagogy: Lectures, Assignment, Laboratory		
Unit I: RELATIONAL DATABASES		9 Hrs
Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL		
Unit II: DATABASE DESIGN		9 Hrs
Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – Dependency Preservation – Multi-valued Dependencies – Join Dependencies - Lossless Decomposition – Normalization.		
Unit III: TRANSACTIONS		9 Hrs
Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control– Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.		
Unit IV: IMPLEMENTATIONTECHNIQUES		9 Hrs
RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.		
Unit V: ADVANCEDTOPICS		9 Hrs
Distributed Databases: Architecture, Data Storage, Transaction Processing – Object based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems. Database Security		
Text Books:		
<ol style="list-style-type: none"> Silberschatz, Korth, Sudarshan, Database System Concepts, McGraw-Hill Higher Education, International edition, 2019. Ramez Elmasri, and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, Seventh Edition, 2016. Raghu Ramakrishnan, Database Management Systems, McGraw-Hill Publications, Fourth Edition, 2015. 		

4. Date C J, Kannan A and Swamynathan S, An Introduction to Database Systems, Pearson Education, Eighth Edition, 2006.
5. Alan Beaulieu, Mastering SQL Fundamentals, O'Reilly, Second Edition, 2009.

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Students should decide on a case study and formulate the problem statement.	3 hours
2	Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) Note: Students are required to submit a document by drawing an ER Diagram to the Lab teacher.	3 hours
3	Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys) Note: Students are required to submit a document showing the database tables created from ER Model.	3 hours
4	Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form	3 hours
5	Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.	3 hours
6	Practicing DML commands- Insert, Select, Update, Delete .Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc.	3 hours
7	Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer).	3 hours
8	Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.	3 hours
9	Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger	3 hours
10	Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure. Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.	3 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2
CO2	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
CO3	3	2	1	1	-	-	-	-	-	-	-	-	3	3	2
CO4	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2
CO5	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
Avg	2	1	-	-	-	-	-	-	-	-	-	-	3	3	2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 233	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	PRINCIPLES OF MANAGEMENT	<i>Minor</i>
Learning Objectives:		
<ol style="list-style-type: none"> To provide students with a comprehensive understanding of core management concepts, functions, and their practical applications in business environments To develop decision-making, leadership, and organizational skills through the study of strategic management, planning, and control techniques 		
Learning Outcome:		
On completion of the course, the students will able to:		
CO1. Understand fundamental management concepts, including the role and functions of managers, and the evolution of management thought		
CO2. Apply planning and strategic management principles to develop decision-making processes and improve organizational effectiveness		
CO3. Analyse organizational structures, processes, and authority relationships to enhance decision-making and delegation within different management contexts		
CO4. Evaluate staffing functions, including recruitment, selection, and performance appraisal, using systematic human resource management techniques		
CO5. Create effective leadership, motivation, and control strategies to improve team morale, productivity, and organizational performance		
Pedagogy: Lecture, Discussion, Case studies, observations, presentation		
Unit I: INTRODUCTION TO MANAGEMENT:		9 Hrs
Concept- Scope – Significance – Role - Nature- Purpose - Management as Profession - Management & Administration, Functions of Management. Management Thought: Neo-Classical School-Classical Schools-Systems School- Contingency Approach to Management.		
Unit II: PLANNING:		9 Hrs
Concept-Importance-Types and Process-Strategic Management Overview and Process-MBO-MBE: Decision Making Concept, Process- Types- Techniques and Importance.		
Unit III: ORGANISING:		9 Hrs
Principles, Structure- Process-Importance- Organisational Design: Departmentation-Span of Control; Delegation of Authority- Decentralisation of Authority- Organisation Charts.		
Unit IV: STAFFING:		9 Hrs
Definition of Staffing- An overview of Staffing Function- The System Approach to Human Resource Management – Recruitment – Selection – Placement – Promotion – Separation - Performance Appraisal - The Peter’s Principle.		
Unit V: DIRECTING AND CONTROLLING:		9 Hrs
Motivation, Morale and Productivity-Leadership-Communication (Organisational)-Controlling- Concepts and Process-Controlling as a Feedback System-Requirements for Effective Control-Major Controlling Techniques-Budgetary and Non-Budgetary Control Devices-Statistical Data-Time-Event Network Analysis.		
Text Books:		
<ol style="list-style-type: none"> Robbins, Stephen P., and Mary Coulter. Management 13E. Pearson India, Latest Michael A.Hitt,J Stewart Black & Layman W.Porter. Management Pearson India, Latest Knootz & O-Donnel “Essentials of Management”. Neeru Vasistha “Priciples of Management” Peter F.Drucker “The Practice of Management” 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3									3				3	
CO2			3								3		3		
CO3		3			3										3
CO4						3	3						3		
CO5				3				3							3
Avg	3	3	3	3	3	3	3	3	-	-	-	-	3	3	2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 234	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	OBJECT ORIENTED PROGRAMMING	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. To introduce the Object Orientated Programming concepts. 2. To apply object-oriented concepts to solve real time computing problems. 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the concepts of object-oriented programming elements and constructs.</p> <p>CO2. Develop programs using inheritance, packages and interfaces.</p> <p>CO3. Use exception handling mechanisms and multithreaded model in solving real world problems</p> <p>CO4. Build Java applications with I/O packages, string classes, collections and generics concepts</p> <p>CO5. Integrate the concepts of event handling, components and controls for developing GUI based applications</p>		
<p>Pedagogy: <i>Lecture, Assignment, Laboratory</i></p>		
<p>UNIT I: INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING</p>		<p>9 HRS</p>
<p>Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- Java Doc comments</p>		
<p>UNIT: II: INHERITANCE, PACKAGES AND INTERFACES</p>		<p>9 HRS</p>
<p>Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces</p>		
<p>UNIT III: EXCEPTION HANDLING AND MULTITHREADING</p>		<p>9 HRS</p>
<p>Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java’s Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model— Priorities – Synchronization – Inter Thread Communication – Multithreading. Wrappers – Auto boxing</p>		
<p>UNIT IV: I/O, GENERICS, STRING HANDLING</p>		<p>9 HRS</p>
<p>I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.</p>		
<p>UNIT V: JAVA FX EVENT HANDLING, CONTROLS AND COMPONENTS</p>		<p>9 HRS</p>
<p>JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane - Menus</p>		

Text Books:

1. Herbert Schildt, “Java: The Complete Reference”, 11 th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, “Introducing JavaFX 8 Programming”, 1 st Edition, McGraw Hill Education, New Delhi, 2015
3. Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11 th Edition, Prentice Hall, 2018.
4. Paul Deitel, Harvey Deitel, “Java How to Program”, Pearson, Eleventh edition, 2017.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	1	-	-	-	-	-	-	2	3	2	1
CO2	3	3	3	-	3	-	-	-	-	-	-	2	3	2	1
CO3	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
CO4	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
CO5	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
Avg	3	2.8	2.8	1	2.8	-	-	-	-	-	-	2	3	2	1

*S-Strong (3)**M-Medium (2)**L-Low (1)*

Subject Code BTCB 235	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	MICROPROCESSOR AND MICROCONTROLLER	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To learn the fundamentals of microprocessors and applications, interfacing the external devices to the processor according to the user requirements, enabling to create novel products and solutions for real time problems. To enrich assembly language programming knowledge using 8085, 8086, 8051 microprocessor and microcontroller. 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. To understand the inner working components of 8085 Microprocessor.		
CO2. To understand 8085 Interrupts and 8237 DMA controller.		
CO3. To understand different types of Memory mapping and Interfacing.		
CO4. To understand the components of 8086 Microprocessor.		
CO5. To understand the organization of 8051 Microcontroller and Interfacing.		
Pedagogy: Lecture, Assignments and Practical		
Unit I - INTEL 8085 MICROPROCESSOR		9 Hrs
Introduction - Need for Microprocessors, Evolution, Intel 8085 Hardware - Architecture, Pin description, Internal Registers, Arithmetic and Logic Unit, Control Unit, Instruction word size - Addressing modes, Instruction Set, Assembly Language Programming - Stacks and Subroutines, Timing Diagrams, Evolution of Microprocessors, 16-bit, 32-bit microprocessors and 64 bit microprocessor		
Unit II – INTEL 8085 INTERRUPTS AND DMA		9 Hrs
8085 Interrupts - Software and Hardware Interrupts - 8259 Programmable Interrupt Controller - Data Transfer Techniques - Synchronous - Asynchronous and Direct Memory Access (DMA) and 8237 DMA Controller- 8253 Programmable Interval Timer.		
Unit III- MEMORY & I/O INTERFACING		9 Hrs
Types of memory - Memory mapping and addressing , Concept of I/O map, types - I/O decode logic, Interfacing key switches and LEDs - 8279 Keyboard/Display Interface - 8255 Programmable Peripheral Interface - Concept of Serial Communication - 8251 UART/ USART - RS232C Interface.		
Unit IV – TREES		9 Hrs
Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree. Introduction to B-Tree and B+ Tree.		
Unit V–SORTING, HASHING AND GRAPHS		9 Hrs
Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table – Hash Function and its characteristics. Graph: Basic Terminologies and Representations – Graph traversal algorithms.		
Text Books:		
7. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Computer Science Press, Second Edition, 2018.		
8. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.		
9. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4		

th Edition, 2009.

10. Mark A. Weiss. Data Structures and Algorithm Analysis in C++. India: Pearson Education, 2007.
11. Kurt Mehlhorn, and Peter Sanders – Algorithms and Data Structures The Basic Toolbox, Springer-Verlag Berlin Heidelberg, 2008.
12. Horowitz, Sahni, and S. Anderson-Freed , Fundamentals of Data Structures in C Universities press, Second Edition, 2008.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	-	-	-	-	-	-	3	3	3	3
CO2	3	3	3	2	3	-	-	-	-	-	-	3	3	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	3	3	3	3
CO4	3	3	3	2	3	-	-	-	-	-	-	3	3	3	3
CO5	3	3	3	2	3	-	-	-	-	-	-	3	3	3	3
Avg	3	3	3	2	3	-	-	-	-	-	-	3	3	3	2.8

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 236	Subject Title	L T P C 3 0 0 3
Cognitive	PROBABILITY AND STATISTICS	Multidiscipline
Learning Objectives:		
<ol style="list-style-type: none"> To impart the basics of statistics from business perspective To provide knowledge and wisdom on the application of statistical tools. 		
Learning Outcomes:		
<p>CO1. Understanding the fundamentals of statistics and important statistical techniques and models.</p> <p>CO2. Applying statistical tools for solving the business related problems.</p> <p>CO3. Acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.</p> <p>CO4. Use the ideas of probability and random variables in solving engineering problems.</p> <p>CO5. Develop critical thinking based on empirical evidence and the scientific approach to knowledge development.</p>		
Pedagogy: Lecture, Assignments		
Unit I - Probability and Sampling Distribution		
Meaning – Random Variables – Use of Expected Value in Decision Making – Binomial Distribution – Poisson Distribution – Normal Distribution – Sampling - Meaning – Random Sampling – Design of Experiments – Introduction to Sampling Distribution		
Unit II – Measures of Central Tendency		
Measures of Central Tendency and Dispersion in Frequency Distributions – Summary Statistics – Measure of Central Tendency – Arithmetic mean – Weighted Mean – Geometric Mean – Median – Mode – Dispersion – Average Deviation Measures - Coefficient of Variance (CV).		
Unit III - Testing of Hypothesis		
One Sample Test –Introduction – Concepts Basics to the Hypothesis Procedure – Testing of Hypothesis –Hypothesis Testing of Means when the Population Standard Deviation is Known – Measuring the Power of a Hypothesis Test – Hypothesis Testing of Proportions: Large Samples – Hypothesis Testing of Means when the Population Standard Deviation is Not Known – Testing of Hypothesis: Two Sample Tests – Hypothesis Testing for Differences between Means and Proportions – Tests for Differences between Means: Large Sample Sizes – Tests for Difference between Means: Small Sample Sizes – Testing Differences between Means with Dependent Samples – Tests for Differences between Proportions: Large Sample Sizes		
Unit IV Non-parametric Tests		
Introduction – Chi – Square as a Test of Independence – Chi – Square as a Test of Goodness of Fit: Testing the appropriateness of a Distribution – Analysis of Variance (ANOVA) – Inferences about a Population Variance – Inferences about Two Population Variances.		
Unit V- Simple Regression and Correlation		
Introduction – Estimation using the Regression Line – Correlation analysis – Making inferences about Population Parameters – Using Regression and Correlation Analyses: Limitations, Errors, and Caveats.		
Text Books:		
<ol style="list-style-type: none"> Levin. Richard. I and Rubin. David. S ‘Statistics for Management’ Prentice-Hall, 8th Edition. 2017 		

2. Gupta. S.P ‘Statistical Methods’ Sultan Chand & Sons, 48^h Edition, 2022
3. James T. McClave, George Benson, & Terry L. Cincich, “Statistics for Management and Economics” New International Edition, 2013.
4. Hooda, R. P. Statistics for business and economics. Vikas Publishing House, 2013.
5. Davis, Glyn, and Branko Pecar. Business statistics using Excel. Oxford University Press, 2013

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
CO2	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
CO3	2	2	-	-	-	1	-	-	-	-	-	1	2	1	1
CO4	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1
CO5	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1
Avg	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 237	Subject Title	L T P C 0-0-4-2
<i>Cognitive</i>	ACCOUNTING SOFTWARE LAB	<i>Skill course</i>
Learning Objectives:		
<ol style="list-style-type: none"> To familiarize students with the fundamental principles and functionalities of popular accounting software, enabling them to prepare, manage, and analyse financial data efficiently. To develop practical skills in using accounting software like Tally for financial reporting, inventory management, payroll accounting, and tax calculation, enhancing business decision-making capabilities. 		
Learning Outcome:		
On completion of the course, the students will able to:		
CO1. Identify the key features and functionalities of various accounting software, such as Tally and spreadsheet-based accounting tools		
CO2. Explain how to set up and configure accounting software, including the creation of companies, ledgers, vouchers, and inventory management		
CO3. Apply accounting software to perform financial tasks such as voucher entries, invoicing, tax filing (GST and TDS), payroll accounting, and bank reconciliation		
CO4. Analyse financial data to generate reports such as balance sheets, profit & loss accounts, stock summaries, and payroll reports		
CO5. Evaluate the effectiveness of accounting software in automating business processes and improving financial decision-making by comparing different software tools		
Pedagogy: Lectures, Practical, Seminars, Assignments, Quiz, Project, Case Study		
Unit I: Accounting Software		9 Hrs
Various Accounting Software – Preparation accounts using Spread sheets – Preparation accounts using Tally software - Creation and Setting up of Company in Tally – Chart of Group and Group creation – Ledger and Multiple Ledger preparation – Inventory Masters – Stock Group, Multi stock group, Stock categories, Stock items and Units of measurement.		
Unit II: Voucher Entries		9 Hrs
Voucher creation – Types of Vouchers – Chart of Vouchers – Accounting Vouchers – Inventory vouchers – Invoicing – Creation of Cost Centres and Cost Categories – Multiple currency Entries – Interest Calculation – Bank Reconciliation		
Unit III: Inventory Management and Tax Calculation		9 Hrs
Order processing – Reorder levels – Bill of Materials - TDS Reports and Filing – GST Returns – Professional Tax.		
Unit IV: Payroll Accounting		9 Hrs
Employee creation – Salary Definition – Employee Attendance Register – Pay heads creation – salary Report preparation -		
Unit V: Generating Reports		9 Hrs
Trading Account – Profit and loss account and Balance sheet – Account Books and Reports – Inventory Book and Reports – Payroll Reports – Day Book – List of Accounts - Trial Balance – Stock summary – Outstanding Statements		
Text Books:		
<ol style="list-style-type: none"> Official Guide to Financial Accounting using TallyPrime: Managing Your Business Just Got Simpler, Tally Education Pvt. Ltd. Official Guide To Financial Accounting Using TALLY.ERP 9 With GST , Tally Education Pvt. Ltd 		

3. Tally Guru Volume – 1, Tally Education Pvt. Ltd
4. Tally Guru Volume – 2, Tally Education Pvt. Ltd
5. TallyAce, Tally Education Pvt. Ltd

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3	2							2			3	2	
CO3		3	3	2	3				2		2		2	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3				3	2			3
Avg	3	3	2.8	2.7	2.5	-	3	-	2	2	2.7	2.5	2.7	2.7	3

S-Strong (3)

M-Medium (2)

L-Low (1)

SEMESTER IV

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 241	Computer Organization and Architecture	3-0-0-3
BTCB 242	Design and Analysis of Algorithms	3-0-0-3
BTCB 243	Theory of Computation	3-0-0-3
BTCB 244	Advanced Java Programming with lab	3-0-2-4
BTCB 245	Artificial Intelligence	3-0-0-3
BTCB 246	Fundamentals of Financial Management	3-0-0-3
BTCB 247	Discrete Mathematics	3-1-0-4
BTCB 248	Full Stack Development Lab (Skill Course)	0-0-4-2
BTCB 249	Environmental Science (Non-Credit)	3-0-0-0
Total Credits		25

After 2nd Year Exit: Internship during summer (Exit Requirement: 4 Credits for Skill & 6 Credits for Internship): **10 Credits**

NEP PU Guidelines

- ❖ Students exiting the programme after securing 80 credits will be awarded UG Diploma in the relevant Discipline /Subject, provided they secure additional 4 credits in work based vocational courses offered during summer term or internship / Apprenticeship.
- ❖ UG Diploma can be offered in multiple streams pertaining to the major discipline. Summer Internship could be initiated during holidays and continued to the Vth semester.

Subject Code BTCB 241	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	COMPUTER ORGANIZATION AND ARCHITECTURE	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> To familiarize basic concepts of computer organization and architecture To develop a deeper understanding of the hardware environment, memory system, and interfacing techniques. 		
Course Outcomes:		
<p>On completion of the course, the students will be able to:</p> <p>CO1: Understand the basic concepts of computer architecture, CPU design, Memory Design and I/O interface.</p> <p>CO2: Apply the arithmetic operations using various algorithms and understand the basics of instructions sets</p> <p>CO3: Analyze cost performance and design trade-offs in designing and constructing a computer processor.</p> <p>CO4: Interpret the concepts of I/O organization, storage subsystems</p> <p>CO5: Implement parallelism in processing for performance enhancements.</p>		
Pedagogy: Lectures, Assignments, Presentations.		
UNIT I: INTRODUCTION AND OVERVIEW OF COMPUTER ARCHITECTURE 9 Hrs		
Computer Architecture - Organization - IAS Computer, Functionality, Machine instructions and addressing modes - Instruction execution cycle- Assembly language programming-Subroutine call and return mechanisms - Performance of processor.		
UNIT II: DATA REPRESENTATION, COMPUTER ARITHMETIC AND CPU DESIGN 9 Hrs		
Data Representation, Hardware and software implementation of arithmetic unit for common Arithmetic operations: addition, subtraction, multiplication, division. Central Processing Unit Design - CISC & RISC, ALU, data-path and control unit, Microprogramming control unit, Instruction Pipelining.		
UNIT III: MEMORY SYSTEM ORGANIZATION & ARCHITECTURE 9 Hrs		
Memory systems hierarchy-Main memory organization-Types of Main memory-memory interleaving and its characteristics and performance- Cache memories: address mapping-line size-replacement and policies-coherence- Virtual memory systems- TLB- Reliability of memory systems- error detecting and error correcting systems.		
UNIT IV: SECONDARY STORAGE INTERFACING AND COMMUNICATION 9 Hrs		
I/O fundamentals: handshaking, buffering-I/O techniques: programmed I/O, interrupt-driven I/O, DMA-Interrupt structures: vectored and prioritized-interrupt overhead- Buses: Synchronous and asynchronous-Arbitration – External storage Devices – RAID LEVELS – I/O Performance.		
UNIT V: PARALLEL PROCESSING AND PERFORMANCE ENHANCEMENTS 9 Hrs		
Classification of models -Flynn’s taxonomy of parallel machinemodels (SISD, SIMD, MISD, MIMD) Pipelining-Pipelined data path-Hazards - Multiprocessor architecture- Shared Memory architecture-Distributed architecture.		
Text Books:		
<ol style="list-style-type: none"> Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer organization, McGraw Hill, Fifth edition, Reprint 2011. David A. Patterson and John L. Hennessy “Computer Organization and Design-The Hardware/Software Interface” 5th edition, Morgan Kaufmann, 2011. William Stallings, Computer Organization and Architecture 10th Ed, Pearson, 2019 John P. Hayes, Computer Architecture and Organization, McGraw Hill Education, 5 edition, 2017 Shameem Akhter and Jason Roberts, Multi-Core Programming, 1st edition, Intel Press, 2012 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	-	1	-	-	-	-	1	-	-	3	-	-
CO2	2	1	2	-	1	-	-	-	-	1	-	-	3	-	-
CO3	3	1	2	-	1	-	-	-	-	1	-	-	3	-	-
CO4	3	1	2	-	1	-	-	-	-	1	-	-	3	-	-
CO5	3	1	2	-	1	-	-	-	-	1	-	-	3	-	-
Avg	3	1	2	-	1	-	-	-	-	1	-	-	3	-	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code	Subject Title	L T P C
BTCB 242		3 0 0 3
<i>Technical</i>	DESIGN AND ANALYSIS OF ALGORITHMS	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> To demonstrate various algorithm analysis and design techniques To applying them to find solutions to realworld problems. 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. To understand and derive the time and space complexities of algorithms.		
CO2. To understand the divide-and-conquer and greedy techniques.		
CO3. To formulate and design the Dynamic Programming approach.		
CO4. To apply Backtracking technique to solve real world problems.		
CO5. To design and analyze Branch and Bound technique.		
Pedagogy: Lectures, Assignments, Presentations.		
UNIT I: INTRODUCTION		9 Hrs
Algorithm: Definition and Pseudocode - Asymptotic Notations – Worst Case, Best Case and Average Case Analysis; Big Oh, Omega and Theta Notations; Analyzing Control Structures. Analysis of Sorting and Searching algorithms: Heap, Shell, Radix, Insertion, Selection and Bubble Sort; Sequential, Binary and Fibonacci Search. Recursive Algorithms, Analysis of Non-Recursive and Recursive Algorithms, Solving Recurrence Equations.		
UNIT II: DIVIDE AND CONQUER, GREEDY APPROACHES		9 Hrs
Divide and Conquer: General Method – Binary Search – Maximum and Minimum – Merge Sort - Quick Sort – Strassen’s Matrix Multiplication. Greedy Method: General Method – Knapsack Problem – Minimum Spanning Tree Algorithms – Single Source Shortest Path Algorithm – Scheduling, Optimal Storage on Tapes, Optimal Merge Patterns.		
UNIT III: DYNAMIC PROGRAMMING		9 Hrs
General Method – Multi-Stage Graphs – All Pair Shortest Path Algorithm – 0/1 Knapsack and Travelling Salesman Problem – Chained Matrix Multiplication.		
UNIT IV: BACKTRACKING		9 Hrs
The General Method – 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycle – Knapsack Problem.		
UNIT V: BRANCH AND BOUND		9 Hrs
Least Cost (LC) Search – The 15-Puzzle Problem – Control Abstractions For LC-Search – Bounding – FIFO Branch and-Bound - 0/1 Knapsack Problem – Travelling Salesman Problem. Introduction to NP Hard and NP-Completeness..		
Text Books:		
<ol style="list-style-type: none"> Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Galgotia Publications, Pvt. Ltd., 2nd Edition, 2008. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Theory and Practice PHI, 2010. Thomas H. Corman, Charles E. Leiserson, Ronald and L. Rivest, Introduction to Algorithms, Prentice-Hall of India, 2nd Edition, 2003. Gajendra Sharma, “Design and Analysis of Algorithms”, Khanna Publishing House, New Delhi, 4th Edition, 2015. Michael T Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis, and Internet Examples”, Wiley, 2nd Edition, 2006. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	-	1	-	-	-	-	2	3	2	-
CO2	3	3	3	2	-	-	1	-	-	-	-	2	3	2	-
CO3	3	3	3	2	-	-	1	-	-	-	-	2	3	2	-
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	2	-
CO5	3	3	3	2	-	-	-	-	-	-	-	2	3	2	-
Avg	3	3	3	2	-	-	1	-	-	-	-	2	3	2	-

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 243	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	THEORY OF COMPUTATION	<i>Major</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To understand the types of grammars and models of automata. To establish connections among grammars, automata and formal languages. 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the basic concepts of Computational models.</p> <p>CO2. Construct automata theory using Finite Automata</p> <p>CO3. Enumerate regular expressions for any pattern</p> <p>CO4. Design context free grammar and Pushdown Automata, Turing Machine</p> <p>CO5. Apply theory of computations for various problems</p>		
<p>Pedagogy: Lecture, Discussion, Case studies, Assignments</p>		
<p>Unit I - Languages and Grammars:</p> <p>Overview of a Computational Models - Languages and Grammars - Alphabets - Strings - Operations on Languages, Overview on Automata- Finite Automata - Deterministic Finite Automata - Non-deterministic Finite Automata - NFA with/without epsilon transitions - conversion of NFA to DFA, Equivalence of NFA and DFA – minimization of DFA</p>		9 Hrs
<p>Unit II - Regular Expressions and Languages:</p> <p>Regular Expression - FA and Regular Expressions: FA to regular expression and regular expression to FA- - Pattern matching and regular expressions - Regular grammar and FA- Pumping lemma for regular languages - Closure properties of regular languages.</p>		9 Hrs
<p>Unit III -Context Free Grammars:</p> <p>Context-Free Grammar – Derivations- Parse Trees - Ambiguity in CFG - CYK algorithm – Simplification of CFG – Elimination of Useless symbols, Unit productions, Null productions - Normal forms for CFG: CNF and GNF - Pumping Lemma for CFL - Closure Properties of CFL</p>		9 Hrs
<p>Unit IV Pushdown Automata and Turing Machine:</p> <p>Pushdown automata - Languages of a Pushdown automata – Power of Non-Deterministic/Deterministic Pushdown Automata - Turing Machines - Multi head and Multi tape Turing Machines – Universal Turing Machine - The Halting problem - P and NP, NP- completeness - NP -Complete problems</p>		9 Hrs
<p>Unit V- Recursive and Recursively Enumerable Languages:</p> <p>Recursive and Recursively Enumerable Languages, Language that is not Recursively Enumerable – computable functions – Chomsky Hierarchy – Undecidable problems. Recent Trends & Future of Formal Languages and Automata</p>		9 Hrs
<p>Text Books:</p> <ol style="list-style-type: none"> J.E. Hopcroft, R. Motwani and J.D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Third Edition, Pearson Education, India 2008. 		

2. Peter Linz, “An Introduction to Formal Languages and Automata”, Sixth Edition, Jones & Bartlett, 2016. ISBN: 978-9384323219
3. Micheal Sipser, Introduction of the Theory and Computation, Cengage; 3rd edition, 2014.
4. Dexter C. Kozen, “ Automata and Computability”, Springer; Softcover reprint of the original 1st ed. 1997 edition. 2012
5. K.L.P.Mishra and N.Chandrasekaran, “Theory of Computer Science: Automata Languages and Computation”, 3rd Edition, Prentice Hall of India, 2006

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	2	3	-	-	-	-	1	1	2	3	1	3	2
CO2	2	2	3	2	1	-	-	-	3	3	2	3	3	1	2
CO3	2	2	3	2	1	-	-	-	1	3	1	2	1	2	2
CO4	2	2	2	1	-	-	-	-	1	3	3	2	1	3	2
CO5	2	2	2	1	1	-	-	-	1	1	3	2	3	1	3
Avg	1.8	2.5	2.4	1.8	1	-	-	-	1.4	2.5	2.5	2.4	1.8	2	2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 244	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	ADVANCED JAVA PROGRAMMING WITH LAB	<i>Major</i>
Course Objectives:		
1. To learn the concepts of OOPS principles, packages, interfaces, generic classes and GUI applications using JavaFX.		
Course Outcome:		
On completion of the course, the students will be able to:		
CO1. To apply the concepts of classes and objects to solve simple problems.		
CO2. To develop programs using inheritance, packages and interfaces.		
CO3. To apply exception handling mechanisms and multithreaded model to solve real world problems.		
CO4. To build Java applications with I/O packages, string classes, Collections and generics concepts.		
CO5. To integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications.		
Pedagogy: Lecture, Practical, Assignments		
Unit I – INTRODUCTION		9 Hrs
Java Buzzwords- Overview of Java - Data Types, Variables and Arrays, Operators, Control Statements, Programming Structures in Java, Defining classes in Java, Constructors- Methods –Access specifiers.		
Unit II - INHERITANCE, PACKAGES AND INTERFACES		9 Hrs
Overloading Methods – Objects as Parameters, Returning Objects, Static, Nested and Inner Classes- Inheritance: Basics, Types of Inheritance, Super keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, final with Inheritance - Packages and Interfaces- Packages, Packages and Member Access, Importing Packages, Interfaces.		
Unit III - EXCEPTION HANDLING AND MULTITHREADING		9 Hrs
Exception Handling basics, Multiple catch Clauses, Nested try Statements, Java’s Built-in Exceptions, User defined Exception- Multithreaded Programming-Java Thread Model, Creating a Thread and Multiple Threads, Priorities, Synchronization, Inter Thread Communication, Multithreading.		
Unit IV GENERIC PROGRAMMING AND STRING HANDLING		9 Hrs
I/O Basics, Reading and Writing Console I/O, Reading and Writing Files- Generics, Generic Programming, Generic classes, Generic Methods, Bounded Types, Restrictions and Limitations - Strings: Basic String class, methods and String Buffer Class.		
Unit V- JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS		9 Hrs
JavaFX Events and Controls- Event Basics, Handling Key and Mouse Events- Controls, Checkbox, ToggleButton, RadioButtons , ListView, ComboBox, ChoiceBox, Text Controls, ScrollPane. Layouts, FlowPane, HBox and VBox, BorderPane, StackPane, GridPane Menus: Basics, Menu, Menu bars, MenuItem.		
Text Books:		
1. Herbert Schildt, “Java: The Complete Reference”, McGraw Hill Education, 11 th Edition, 2019.		
2. Herbert Schildt, “Introducing JavaFX 8 Programming”, McGraw Hill Education, 1st Edition, 2015.		

3. Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, Prentice Hall, 11th Edition, 2018.

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Program to implement constructors and destructors with array of objects.	3 hours
2	Program to demonstrate function overloading.	3 hours
3	Program to implement different types of inheritances like multiple, Multilevel and hybrid.	3 hours
4	I/O Program to demonstrate the use of abstract classes.	3 hours
5	Program to demonstrate I/O streams and functions. Program to perform all possible type conversions.	3 hours
6	Program to demonstrate exception handling technique.	3 hours
7	Program to implement networking concepts.	3 hours
8	Program to design and implement JDBC.	3 hours
9	Program to design an event handling event for simulating a simple calculator.	3 hours
10	Build GUI based application development using JavaFX.	3 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	1	-	-	-	-	-	-	2	3	2	1
CO2	3	3	3	-	3	-	-	-	-	-	-	2	3	2	1
CO3	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
CO4	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
CO5	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
Avg	3	3	2.6	1	2.6	-	-	-	-	-	-	2	3	2	1

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 245	Subject title	L T P C 3 0 0 3
<i>Technical</i>	ARTIFICIAL INTELLIGENCE	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> To impart artificial intelligence principles, techniques, and history. To assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem-solving, and learning methods in solving engineering problems. 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Understand the concepts of artificial intelligence and intelligent agents.		
CO2. Apply the principles of AI in problem solving, knowledge representation and learning.		
CO3. Analyze and illustrate how search algorithms and planning play vital role in problem solving.		
CO4. Demonstrate knowledge of reasoning for solving real world problems.		
CO5. Determine the effectiveness of truths by knowledge representation methods in AI.		
Pedagogy: Lectures, Assignments, Case Study		
Unit I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE		6 Hrs
Introduction: What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence.		
Intelligent Agents: Agents and Environments, The Nature of Environments, The Structure of Agents, goal-based agents, utility-based agents, learning agents.		
Unit II: PROBLEM SOLVING BY SEARCHING		12 Hrs
Problem-Solving Agents, Example Problems, Search Algorithms, Uninformed Search Strategies: Breadth-first search, Dijkstra's algorithm or uniform-cost search, Depth-first search and the problem of memory. Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Memory-bounded search, Bidirectional heuristic search, Heuristic Functions.		
Unit III: LOCAL SEARCH AND ADVERSARIAL SEARCH		9 Hrs
Local Search algorithms – Hill-climbing search, Simulated annealing, Genetic Algorithm, Local Search in Continuous Spaces, Search with Nondeterministic Actions. Adversarial Search: Game Trees and Minimax, Heuristic Alpha--Beta Tree Search, Monte Carlo Tree Search.		
Unit IV: KNOWLEDGE AND REASONING		9 Hrs
Logical Agents: Knowledge-Based Agents, Propositional Theorem Proving, Effective Propositional Model Checking, gents Based on Propositional Logic. First-Order Logic: Syntax and Semantics of First-Order Logic, Knowledge Engineering in First-Order Logic.		
Unit V: KNOWLEDGE REPRESENTATION		9 Hrs
Ontological Engineering, Categories and Objects, Events, Mental Objects and Modal Logic, Reasoning Systems for Categories, Reasoning with Default Information. Automated Planning: Definition of Classical Planning, Algorithms for Classical Planning, Heuristics for Planning, Hierarchical Planning, Time, Schedules, and Resources.		
Text Books:		
<ol style="list-style-type: none"> Stuart J. Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Fourth Edition, Pearson, 2021. Poole, D. and Mackworth, A. Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010 Ric, E., Knight, K and Shankar, B. Artificial Intelligence, 3rd edition, Tata McGraw Hill. 2009 Luger, G.F.. Artificial Intelligence -Structures and Strategies for Complex Problem Solving, 6th edition, Pearson, 2008. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	3		1				1	3	3	2
CO2	3	3	3	3	3	3		1				1	3	3	2
CO3	2	2	3	3	3	3		1				1	3	3	2
CO4	2	2	3	2	2	3		1				1	3	3	1
CO5	2	2	3	2	3	3		1				1	3	3	1
Avg	2.2	2.2	2.6	2.4	2.4	3		1				1	3	3	1.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 246	Subject Title	L T P C 3-0-0-3
<i>Cognitive</i>	FUNDAMENTALS OF FINANCIAL MANAGEMENT	<i>Minor</i>
Learning Objectives:		
<ol style="list-style-type: none"> To provide students with a foundational understanding of financial management principles, including financial planning, decision-making, and capital structure in various business environments. To equip students with the tools and techniques required for making informed financial decisions related to investments, dividends, and working capital management. 		
Learning Outcome:		
On completion of the course, the students will able to:		
CO1. Identify and recall key concepts in financial management, including financial planning, time value of money, and cost of capital		
CO2. Explain the significance of capital structure, leverage, and financial planning in decision-making for businesses		
CO3. Apply financial management principles to evaluate capital budgeting decisions, lease contracts, and corporate restructuring		
CO4. Analyse different dividend and liquidity decisions, including working capital management, to assess their impact on business performance		
CO5. Evaluate various financial strategies and policies related to capital structure, working capital, and dividends to optimize organizational financial health		
Pedagogy: Lectures, Practical, Seminars, Assignments, Quiz, Project, Case Study		
Unit I: INTRODUCTION TO FINANCIAL MANAGEMENT		8 Hrs
Finance Functions - Interface between Finance and Other Business Functions – Concept of Financial Management - Goals of Financial Management - Financial Planning: Introduction, Objectives, Benefits, Guidelines, Steps in Financial Planning, Factors Affecting Financial Planning, Estimation of Financial Requirements of a Firm, Capitalisation - Time Value of Money.		
Unit II: FINANCIAL DECISION		9 Hrs
Cost of Capital: Introduction, Meaning of Cost of Capital, Cost of Different Sources of Finance, Weighted Average Cost of Capital - Leverage: Introduction, Operating Leverage, Application of operating leverage, Financial Leverage, Combined Leverage - Capital Structure: Introduction, Features of an Ideal Capital Structure, Factors Affecting Capital Structure, Theories of Capital Structure.		
Unit III: INVESTMENT DECISION		10 Hrs
Capital Budgeting: Introduction, Importance of Capital Budgeting, Complexities Involved in Capital Budgeting Decisions, Phases of Capital Expenditure Decisions, Identification of Investment Opportunities, Rationale of Capital Budgeting Proposals, Capital Budgeting Process, Investment Evaluation, Appraisal Criteria.		
Evaluation of lease contracts: Introduction – Meaning and essential – Classification – Financial lease – Operating lease – Sales and lease back – Indirect lease; Corporate Restructuring: Introduction – Scope – Types; Financial Restructuring: Share split – Consolidation – Cancellation of paid up capital		
Unit IV: DIVIDEND DECISION		8 Hrs
Dividend Decisions: Introduction, Traditional Approach, Dividend Relevance Model, Miller and Modigliani Model, Stability of Dividends, Forms of Dividends, Stock Split.		
Unit V: LIQUIDITY DECISION		10 Hrs
Working Capital Management: Introduction, Components of Current Assets and Current Liabilities, Concepts of Working Capital, Objective of Working Capital Management, Need for Working Capital,		

Operating Cycle, Determinants of Working Capital, Approaches for Working Capital Management, Estimation of Working Capital - Cash Management - Inventory Management Receivable Management: Introduction, Costs Associated with Maintaining Receivables, Credit Policy Variables, Evaluation of Credit Policy.

Text Books:

1. **Khan MY, Jain PK., FINANCIAL MANAGEMENT, Tata Mc Hill, New Delhi**
2. **Pandey I M., FINANCIAL MANAGEMENT, Vikas Publishing House, Delhi**
3. Prasanna chandra: Financial Management, Tata McGraw Hill, Delhi
4. Van Horne, James C: Financial Management and Policy, Prentice Hall, Delhi
5. Brigham, Eugene and Earnhardt C Michael., Financial Management: Theory and Practice

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3											2	3	
CO3		3	3	2						2			3	3	
CO4		3	3	3	2		2				3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2	-	2.5	3	2	2	3	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 247	Subject Title	L T P C 3 1 0 4
<i>Cognitive</i>	DISCRETE MATHEMATICS	<i>Multidiscipline</i>
Course Objectives:		
<p>1. To familiarize basics of set theory concepts and explore a variety of various mathematical structures by focusing on mathematical objects, operations, and resulting properties</p> <p>2. To make the students to understand formal logical reasoning techniques and application of logic to analyse and write proofs.</p>		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. Understand and construct precise mathematical proofs.</p> <p>CO2. Apply logic and set theory to formulate precise statements</p> <p>CO3. Analyse and solve counting problems on finite and discrete structures.</p> <p>CO4. Determine and manipulate Combinatorics</p> <p>CO5. Demonstrate graph theory in solving computing problems.</p>		
Pedagogy: Lectures, Problem solving tutorials		
UNIT I: SET THEORY		9 Hrs
<p>Combination of sets, Multisets, Ordered pairs. Relations - Definition, Operations and Properties- Functions: Definition, Classifications and Operations - Recursively defined functions, Natural Numbers: Mathematical Induction, Variants of Induction, and Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.</p>		
UNIT II: ALGEBRAIC STRUCTURES		9 Hrs
<p>Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n. Basic Counting Principles, Balls and Pins problems - Pigeon-Hole Principle - Recurrence relations – Generating Functions - Proof Techniques - Mathematical Induction.</p>		
UNIT III: PARTIAL ORDER SETS		9 Hrs
<p>Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions.</p>		
UNIT IV: PROPOSITIONAL LOGIC		9 Hrs
<p>Propositions, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.</p>		
UNIT V: GRAPHS AND TREES		9 Hrs
<p>Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments - Trees; Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.</p>		
Text Books:		
<ol style="list-style-type: none"> Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017. Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011. 		

3. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5 thEdition, Pearson Education Asia, Delhi, 2013.
4. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
5. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
CO2	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
CO3	2	2	-	-	-	1	-	-	-	-	-	1	2	1	1
CO4	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1
CO5	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1
Avg	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 248	Subject Title	L T P C 0 0 4 2
<i>Technical</i>	FULL STACK SOFTWARE DEVELOPMENT LAB	<i>Skill Course</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To get an overview of the full stack software and web development and to gain knowledge of web development using Flask Framework. To learn the web application deployment in real time scenarios in Linux and Windows platforms. 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the fundamentals of front-end technologies and back-end technologies. CO2. Design and develop responsive web applications using front-end frameworks. CO3. Build and integrate back-end services and APIs using server-side technologies and DBMS. CO4. Implement full-stack solutions to create complete applications. CO5. Apply DevOps principles, including continuous integration and deployment for full-stack applications.</p>		
<p>Pedagogy: <i>Lecture, Practical, Mini project assignments</i></p>		
<p>Unit I: OBJECT ORIENTED APPROACH IN PYTHON</p> <p>Classes – Class Coding Basics: Instances – Behavior Methods – Operator Overloading – Customizing Behavior Methods – Constructors – Polymorphism – Inheritance.</p>		
<p>Unit II: USER INTERFACE APPLICATIONS AND VERSION CONTROL SYSTEM</p> <p>Wxpython installation – Menus and Toolbars – Layout Management – Wxpython Events – Wxpython Dialogs – Widgets – Graphics – Collaborative Version Control Systems – Git Commands – Real Time Usage of Git Commands.</p>		
<p>Unit III: FLASK FRAMEWORK FOR WEB DEVELOPMENT</p> <p>Flask Basics – Routes – Templates – Control Flow – Inheritance – Forms – Modules – Connection with Databases – Relational Database versus NoSQL – Modeling – Mapping Classes to MongoDB – Building Data Layer with Mongo Engine.</p>		
<p>Unit IV: REAL TIME DEPLOYMENT OF WEB APPLICATION</p> <p>Deploy Web Applications with Flask and MongoDB – Example Applications – Blogs – Forums – Auto Evaluation of Student Assignments – Deployment Using AWS or Google Cloud or Heroku.</p>		
<p>Unit V: DEPLOYMENT OF SOFTWARE IN LINUX AND WINDOWS PLATFORM</p> <p>Deployment in Ubuntu Distribution – Creation of .Deb Executable File – Deployment in Windows – Creation of Standalone Executable – Test Cases.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Mark Lutz, “Learning Python”, Fifth Edition, O’ Reilly 2013. Scott Chacon and Ben Straub, “Pro Git”, Free e-book under Creative commons, 2e, Apress, 2016. Miguel Grinberg, “Flask Web Development Developing Web Applications with Python”, OReilly, 2014. Karl Seguin, “The Little Mongo DB Book”, https://github.com/karlseguin/the-littlemongodb-book. Gareth Dwyer, “Flask by Example”, Packt Publishers, 2016. 		

INDICATIVE LAB EXERCISES:

Exercise 1: Create a basic static webpage using HTML to structure the content and CSS for styling. Include headings, paragraphs, lists, and images.	2hrs
Exercise 2: Design a responsive webpage using CSS Flexbox and Grid. Include a navigation bar, a sidebar, and a footer.	2hrs
Exercise 4: Write a JavaScript program to create a dynamic table that adds rows based on user input.	2hrs
Exercise 5: Create a form validation script using JavaScript to check for required fields, valid email formats, and minimum/maximum lengths.	2hrs
Exercise 7: Build a simple weather app using React (or Angular/Vue) that fetches weather data from an API and displays it dynamically.	2hrs
Exercise 8: Develop a shopping cart functionality with React, where users can add items to the cart, view the total cost, and remove items.	2hrs
Exercise 9: Create a RESTful API with Node.js that handles GET, POST, PUT, and DELETE requests for managing a list of users (CRUD operations).	2hrs
Exercise 10: Create a middleware in Express that logs the date and time of every request to the server.	2hrs
Exercise 11: Implement user authentication in an Express app using JWT (JSON Web Tokens). Allow users to register, log in, and access protected routes only after authentication.	2hrs
Exercise 12: Set up a MySQL/MongoDB database and create a table/collection for users. Insert, update, delete, and retrieve data from the database.	2hrs
Exercise 13: Create a Node.js/Express app that connects to a MongoDB/MySQL database and performs basic CRUD operations.	2hrs
Exercise 14: Build a full-stack application where users can sign up, log in, and view their profile. Use React (or Angular/Vue) for the front-end and Node.js/Express for the back-end, with MongoDB/MySQL as the database.	2hrs
Exercise 15: Create a full-stack file upload system where users can upload a profile picture. Use Multer for handling file uploads on the server and display the uploaded images in the front-end.	2hrs
Total	30hrs

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		3					1			3	3	2
CO2	3	3	3	2	3				1	1			3	3	3
CO3	3	3	3	3	3				1	1	1	2	3	2	2
CO4	3	3	3	3	3					1		2	2	3	1
CO5	3	3	3	2	3				2	3	2	3	2	3	3
Avg	3	2.8	2.8	2.5	3	-	-	-	1.3	1.8	1.5	2.3	2.6	2.8	2.2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 249	Subject Title	L T P C 3 0 0 0
<i>Technical</i>	ENVIRONMENTAL SCIENCE	<i>Value Added</i>
Course Objectives:		
<ol style="list-style-type: none"> To work and produce most efficient, economical, eco-friendly finished products. To solve various engineering problems applying ecosystem to produce eco-friendly products. 		
Course Outcomes:		
<p>On completion of the course, the students will be able to:</p> <p>CO1. To understand the basic concepts of industrial management.</p> <p>CO2. To understand the importance of air and noise pollution.</p> <p>CO3. To analyze the importance of solid and water pollution.</p> <p>CO4. To understand the importance of renewable sources of solar energy.</p> <p>CO5. To understand the environmental management in fabrication industry and solid waste management</p>		
Pedagogy: <i>Lecture, Practical, assignments</i>		
Unit I: ECOSYSTEM		9 Hrs
Structure of ecosystem-Biotic & Abiotic components- Food chain and food web- Aquatic (Lentic and Lotic) and terrestrial ecosystem- Carbon, Nitrogen, Sulphur, Phosphorus cycle- Global warming, Causes, effects, process, Green House Effect, Ozone depletion.		
Unit II: AIR AND NOISE POLLUTION		9 Hrs
Definition of pollution and pollutant-Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler)- Air Pollutants: Types, Particulate Pollutants- Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)- Gaseous Pollution Control, Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler- Noise pollution, sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000.		
Unit III: WATER AND SOIL POLLUTION		9 Hrs
Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD- Definition, calculation- Waste Water Treatment, Primary methods, sedimentation, froth flotation, Secondary methods- Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method- Membrane separation technology, RO (reverse osmosis).		
Unit IV: RENEWABLE SOURCES OF ENERGY SOLAR ENERGY		9 Hrs
Basics of Solar energy- Flat plate collector (Liquid & Air). Theory of flat plate collector- Importance of coating- Advanced collector- Solar pond- Solar water heater, solar dryer- Solar stills- Biomass: Overview of biomass as energy source- Thermal characteristics of biomass as fuel Anaerobic digestion- Biogas production mechanism- Utilization and storage of biogas- New Energy Sources, Need of new sources- Different types new energy sources- Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion) Concept, origin and power plants of geothermal energy.		
Unit V: SOLID WASTE MANAGEMENT, ISO 14000 & ENVIRONMENTAL MANAGEMENT		9 Hrs
Solid waste generation Sources and characteristics of Municipal solid waste, E- waste, Biomedical waste- Air quality act 2004, air pollution control act 1981 and Water Pollution and Control Act 1996- Structure and role of Central and state pollution Control Board- Concept of Carbon Credit, Carbon		

Footprint- Environmental management in fabrication industry- ISO14000: Implementation in industries, Benefits.

Text Books:

1. S.C. Sharma & M.P. Poonia, “Environmental Studies”, Khanna Publishing House, New Delhi, 2021.
2. Arceivala, Soli Asolekar, Shyam, “Waste Water Treatment for Pollution Control and Reuse”, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007.
3. Nazaroff, William, Cohen, Lisa, “Environmental Engineering Science”, Willy, New York, 2000.
4. O.P. Gupta, “Elements of Environmental Pollution Control”, Khanna Publishing House, New Delhi.
5. Aldo Vieira, Da Rosa, “Fundamentals of renewable energy processes”, Academic Press Oxford, 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
CO2	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
CO3	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
CO4	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
CO5	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
Avg	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1

S-Strong (3)

M-Medium (2)

L-Low (1)

SEMESTER V

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 351	Indian Financial System	3-0-0-3
BTCB 352	Computer Networks with Lab	3-0-2-4
BTCB 353	Compiler Design	3-0-2-4
BTCB 354	Operating System with Lab	3-0-2-4
BTCB 355	Parallel and Distributed Computing	3-0-0-3
BTCB 356	Human Resource Management and Organizational Behaviour	3-0-0-3
BTCB 357	Financial Analysis and Planning lab (Skill Course)	0-0-4-2
BTCB 358	Constitution of India (Non-Credit)	3-0-0-0
BTCB 359	Industrial Visit	Non-Credit
Total Credits		23

Subject Code BTCB 351	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	INDIAN FINANCIAL SYSTEM	<i>Major</i>
Course Objectives:		
1. To introduce concepts and theories related to – Financial System in India. 2. To facilitate the application of the concepts and theories into practice in the field of BFSI sectors.		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Understand and appreciate the concepts of Financial Institution, markets and services. CO2. Enrich their knowledge on key areas of financial products and services. CO3. Acquire required knowledge and demonstrate skills sets required for BFSI sectors. CO4. Elucidate the various Financial markets in India. CO5. Enhance the recent trends in Financial services.		
Pedagogy: Lecture, Discussion, Case studies.		
Unit I: Concept Of Financial System		9 Hrs
Formal and informal financial systems, Functions of financial system, Nature and Role of financial institutions and financial markets, Financial system and the economy. Money Market- Emerging Structure of Indian Money Market; Instruments of Money Market; Money Mutual Funds; Commercial Banks — Role in Industrial Finance and Working Capital Finance.		
Unit II: Indian Financial Institutions:		9 Hrs
Development Banks- FCLICICI, Sits and IDBI: Investment Institutions —UTI and other Mutual Funds; Insurance Organization- Life Insurance Corporation of India, Scope and Functions, Objectives of SEBI. Evaluation of the Banking System and Future Trends -Commercial banking-Development Banking- Cooperative and Rural Banking-Banking Regulations-Technological Innovations and Opportunities for Banks.		
Unit III: Capital Market:		9 Hrs
Concept, Structure and Functions of Capital Market; Primary Market- Instruments of Issue and Methods of Flotation; Secondary Market — Concept, Market Players, trading System and Settlement.		
Unit IV: Insurance in India:		9 Hrs
Insurance system- Insurance markets- Insurance Industry- Insurance Act-IRDA, Life and General Insurance- Recent development in Insurance- Future Insurance Opportunities		
Unit V: Merchant Banking:		9 Hrs
Introduction- Role of merchant bankers-Functions-Merchant banking services, Fund based and Non-fund-based services-Public issue-Underwriting-Regulatory framework-Credit rating. Depository services - Pension Funds- Foreign Institutional Investors		
Text Books:		
1. Meir Kohn, Financial Institution and Market, Oxford University Press. New Delhi,2013. 2. Khan, M. Y., Indian Financial System-Theory and Practice, TMH, New Delhi,2013,. 3. Bhole, L. M., Financial Markets and Institutions, Tata McGraw Hill, New Delhi,2009. 4. Pathak, B., Indian Financial System-Pearson, New Delhi,2010. 5. Mukherjee, Ghosh and Roy, Indian Financial System and Financial Market Operations, 6. Dey Book Clifford, Gomez, Financial Markets, Institutions and Financial Services		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	1	-	2	1	-	1	2	1	1	-	2	1
CO2	3	2	-	1	-	2	1	-	1	2	1	1	-	2	1
CO3	3	3	-	2	-	2	2	-	2	3	2	2	2	2	3
CO4	3	3	-	2	-	2	2	-	2	3	2	2	2	2	3
CO5	3	3	-	2	-	2	2	-	2	3	2	2	2	2	3
Avg	3	2.6	-	1.6	-	2	1.6	-	1.6	2.6	1.6	1.6	2	2	2.2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 352	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	COMPUTER NETWORKS WITH LAB	<i>Major</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To study the fundamental concepts of computer networking, protocols, architectures, and applications. To acquire knowledge in design, implement and analyze performance of OSI and TCP-IP based Architectures. 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the basic functions in computer networks</p> <p>CO2. Contrast different types of switching networks and analyse the performance of network.</p> <p>CO3. Implement various error detection and correction mechanisms, flow control mechanisms and various routing protocols.</p> <p>CO4. Design subletting and analyse the performance of network layer, Construct and examine various routing protocols.</p> <p>CO5. Analyze the working of various application layer protocols.</p>		
<p>Pedagogy: Lectures, Assignments, Practical</p>		
<p>Unit I: INTRODUCTION TO COMPUTER NETWORKS</p>		6 Hrs
<p>Introduction: Computer networks and distributed systems, Classifications of computer networks, Preliminaries of layered network structures. Data communication Components: Representation of data and its flow, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media.</p>		
<p>Unit II: NETWORK TOPOLOGY</p>		7 Hrs
<p>LAN: Wired LAN, Wireless LAN, Virtual LAN. Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum</p>		
<p>Unit III: DATA LINK LAYER AND MEDIUM ACCESS SUB LAYER</p>		12 Hrs
<p>Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols – Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA</p>		
<p>Unit IV: NETWORK LAYER</p>		9 Hrs
<p>Internetworking-IP addressing methods –Internet Protocol (IPv4, IPv6)-Address mapping- – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.</p>		
<p>Unit V: TRANSPORT AND APPLICATION LAYER</p>		11 Hrs
<p>Transport layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS improving techniques - Leaky Bucket and Token Bucket algorithms. Application layer: DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls.</p>		

Text Books:

1. **William Stallings. Data and computer communications. Pearson Education India, 2013.**
2. **Tanenbaum, Computer Networks, Pearson Education, 5th Edition, 2013.**
3. Larry L. Peterson, Bruce S. Davie, "Computer networks: a systems approach", 4th Edition, Harcourt Asia, 2007.
4. Peterson and Bruce S. Davie Larry L., "Computer Networks – A Systems approach" -, Morgan Kaufmann Publishers, Elsevier, 5th edition, 2012.

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Study of Basic Network Commands, Demo session of all networking hardware and Functionalities	3 hours
2	Network System Administration: Understanding switches and routers	3 hours
3	Network configuration commands using Linux	3 hours
4	Error detection and correction mechanisms	3 hours
5	Flow control mechanisms	3 hours
6	Simulation of unicast routing protocols	3 hours
7	Observing Packets across the network and Performance Analysis of Routing protocols	3 hours
8	Socket programming (TCP and UDP) – Multi client chatting	3 hours
9	Simulation of Transport layer Protocols and analysis of congestion control techniques in network	3 hours
10	Develop a DNS client server to resolve the given host name or IP address	3 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	3					2		2	3	2	2
CO2	1	1	2	2	3							2	2		2
CO3	2	2	2	2	2					3		1	2	2	
CO4	1	2	1	1	3					2		2	2	3	3
CO5	2	2	2	2	2					1		2	2		1
Avg	1.6	1.8	1.6	1.8	2.6					1.8		1.8	2.2	1.4	1.8

*S-Strong (3)**M-Medium (2)**L-Low (1)*

Subject Code BTCB 353	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	COMPILER DESIGN	<i>Major</i>
Course Objectives:		
<p>1. To familiarize concepts of language translation, phases of compiler design, and functionality of each stage of the compilation process</p> <p>2. To make the student understand parser design, intermediate code generation, and demonstrate code generation.</p>		
Course Outcomes:		
<p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the phases and passes of compilers.</p> <p>CO2. Analyse different parser construction techniques.</p> <p>CO3. Interpret semantics rules, intermediate code generation, and runtime environment.</p> <p>CO4. Develop target code for the machine and symbol table.</p> <p>CO5. Demonstrate code optimization techniques to improve the performance of a program.</p>		
<i>Pedagogy: Lectures, Assignments, and Design Presentations</i>		
UNIT I: COMPILER STRUCTURE AND LEXICAL ANALYSIS		12 Hrs
<p>Introduction- Translators- Compilation and Interpretation- Language processors -The Phases of Compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Finite Automata – Regular Expressions to Automata NFA, DFA – Minimizing DFA - Language for Specifying Lexical Analysers – Lex tool.</p>		
UNIT II: SYNTAX ANALYSIS		12 Hrs
<p>CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, LR parsers (SLR, LALR, and LR), and Error handling and recovery in parsing, handling ambiguous grammar, YACC tool - Design of a syntax Analyzer for a Sample Language</p>		
UNIT III: SYNTAX TRANSLATION & INTERMEDIATE CODE GENERATION		9Hrs
<p>Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions-Design of predictive translator - Type Systems - Type Conversions. Intermediate Languages - Syntax Tree, Three Address Code, Types and Declarations, Translation of declarations, Type Checking, Back patching.</p>		
UNIT IV: RUNTIME ENVIRONMENT AND CODE GENERATION		6 Hrs
<p>Runtime Environments, source language issues, Storage organization – Storage Allocation Strategies, Parameter Passing, Symbol Tables, and Dynamic Storage Allocation, Design of a simple Code Generator - Basic Blocks and Flow graphs, issues in code generation, Dynamic Programming Code Generation.</p>		
UNIT V: CODE OPTIMIZATION		6 Hrs
<p>Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks - Global Data Flow Analysis - Efficient Data Flow Algorithm – Recent trends in Compiler Design.</p>		
Text Books:		
<p>1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman (2007), Compilers Principles, Techniques and Tools, 2nd edition, Pearson Education, New Delhi, India.</p>		

2. Alfred V. Aho, Jeffrey D. Ullman (2001), Principles of compiler design, Indian student edition, Pearson Education, New Delhi, India.
3. Kenneth C. Louden (1997), Compiler Construction– Principles and Practice, 1st edition, PWS Publishing.
4. K. L. P Mishra, N. Chandrashekar (2003), Theory of computer science- Automata Languages and computation, 2nd edition, Prentice Hall of India, New Delhi, India.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	-	-	-	-	-	2	3	3	1
CO2	3	2	3	2	2	2	-	-	-	-	-	-	3	2	1
CO3	3	3	3	2	2	2	-	-	-	-	-	2	3	2	1
CO4	3	3	3	3	3	1	-	-	-	-	-	3	3	2	2
CO5	3	3	3	3	3	2	-	-	-	-	-	-	3	2	2
Avg	3	2.6	3	2.4	2.4	1.8	-	-	-	-	-	1.4	3	2.2	1.2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 354	Subject Title	L T P C 3 0 2 4
Technical	OPERATING SYSTEM WITH LAB	Major
<p>Course Objectives:</p> <ol style="list-style-type: none"> To introduce the operating system concepts, designs and provide skills required to implement the services. To describe the trade-offs between conflicting objectives in large scale system design. 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Interpret the evolution of OS functionality, structures, layers and apply various types of system calls of various process states.</p> <p>CO2. Analyze various scheduling algorithms and process synchronization.</p> <p>CO3. Comprehend the inter process communication and synchronization techniques.</p> <p>CO4. Implement page replacement algorithms, memory management problems and segmentation.</p> <p>CO5. Examine the functionality of file systems, I/O systems, and Virtualization.</p>		
<p>Pedagogy: Lectures, Assignments, Practical</p>		
<p>Unit I: INTRODUCTION TO OS PRINCIPLES</p>		10 Hrs
<p>Introduction to OS: Functionality of OS - OS design issues - Structuring methods - Abstractions, processes, resources - Influence of security, networking, and multimedia. System calls, System/Application Call Interface – Protection: User/Kernel modes - Interrupts -Processes – Structures, Process creation, management in Unix – Threads: User level, kernel level threads and thread models.</p>		
<p>Unit II: SCHEDULING</p>		9 Hrs
<p>Processes Scheduling - CPU Scheduling: Pre-emptive, non-pre-emptive - Multiprocessor scheduling – Deadlocks - Resource allocation and management - Deadlock handling mechanisms: prevention, avoidance, detection, recovery.</p>		
<p>Unit III: CONCURRENCY</p>		10 Hrs
<p>Inter-process communication, Synchronization - Implementing synchronization primitives - Peterson’s solution, Bakery algorithm, synchronization hardware - Semaphores – Classical synchronization problems, Monitors: Solution to Dining Philosophers problem– IPC in Unix, Multiprocessors and Locking - Scalable Locks - Lock-free coordination.</p>		
<p>Unit IV: MEMORY MANAGEMENT</p>		7 Hrs
<p>Main memory management, Memory allocation strategies, Virtual memory: Hardware support for virtual memory (caching, TLB) – Paging - Segmentation - Demand Paging - Page Faults - Page Replacement - Thrashing - Working Set.</p>		
<p>Unit V: VIRTUALIZATION AND FILE SYSTEM MANAGEMENT</p>		9 Hrs
<p>Virtual Machines - Virtualization - Hardware/Software, Server, Service, Network - Hypervisors - Container virtualization - Cost of virtualization - File system interface - File system implementation - File system recovery - Journaling - Soft updates - Log-structured file system - Distributed file system</p>		

Text Books:

- 1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts”, 2018, 10th Edition, Wiley, United States.**
- 2. W. Stallings, Operating systems, Prentice-Hall, 9th edition, 2018.**
3. Harvey M. Deitel, “Operating Systems”, Second Edition, Pearson Education Pvt. Ltd, 2006.
4. Gary Nutt, Operating Systems, Pearson Education Third Edition, 2004.

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Implement your own bootloader program that helps a computer to boot an OS	3 hours
2	Shell Programming (I/O, Decision making, Looping, Multi-level branching)	3 hours
3	Simulation of CPU scheduling algorithms (FCFS, SJF, Priority and Round Robin)	3 hours
4	Implement process synchronization using semaphores / monitors.	3 hours
5	Simulation of Banker s algorithm to check whether the given system is in safe state or not. Also check whether addition resource requested can be granted immediately	3 hours
6	Parallel Thread management using Pthreads library. Implement a data parallelism using multi-threading	3 hours
7	Dynamic memory allocation algorithms - First-fit, Best-fit, Worst-fit algorithms	3 hours
8	Page Replacement Algorithms FIFO, LRU and Optimal	3 hours
9	Implement a file locking mechanism	3 hours
10	Virtualization Setup: Type-1, Type-2 Hypervisor (Detailed Study Report)	3 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2					3	2	3	1	1	2	2
CO2	2	2	3	1	1				2	1	1	2	2	1	2
CO3	1	3	2	2	1				2	2	1	1	1	2	2
CO4	1	3	3	3					1	2	1	2	1	3	2
CO5	3	1	2	1	1				3	2	3	2	2	2	1
Avg	2	2	2.4	1.8	0.6				2.2	1.8	1.8	1.6	1.4	2	1.8

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 355	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	PARALLEL AND DISTRIBUTED COMPUTING	<i>Major</i>
Course Objectives:		
1. To understand the need and fundamentals of parallel computing paradigms 2. To learn distributed computing incorporating fault tolerance.		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Understand the need and fundamentals of parallel computing paradigms CO2. Learn the nuances of parallel algorithm design CO3. Develop programming knowledge with open MP and MPI. CO4. Understand the programming principles in parallel and distributed computing architectures CO5. Design applications by incorporating fault tolerance.		
Pedagogy: Lecture, Discussion, Case studies, presentation		
Unit I: INTRODUCTION TO PARALLEL COMPUTING		9 Hrs
Scope of Parallel Computing – Parallel Programming Platforms – Implicit Parallelism – Limitations of Memory System Performance – Control Structure of Parallel Platforms – Communication Model of Parallel Platforms – Physical Organization of Parallel Platforms – Communication Costs in Parallel Machines – Impact of Process - Processor Mapping and Mapping Techniques.		
Unit II: PARALLEL ALGORITHM DESIGN		9 Hrs
Preliminaries – Decomposition Techniques – Characteristics of Tasks and Interactions – Mapping Techniques for Load Balancing – Methods for Containing Interaction Overheads – Parallel Algorithm Models – Basic Communication Operations – One-to-All Broadcast and All-to-One Reduction – All-to-All Broadcast and Reduction – All-Reduce and Prefix Sum Operations – Scatter and Gather – All-to-All Personalized Communication- Circular Shift – Improving the Speed of some Communication Operations		
Unit III: PROGRAMMING USING MESSAGE PASSING AND SHARED ADDRESS SPACE		9 Hrs
Principles of Message Passing Programming – Building Blocks – Send and Receive Operations – MPI – Message Passing Interface – Topologies and Embedding – Overlapping Communication with Computation – Collective Communication and Computation Operations – Groups and Communicators – POSIX thread API – OpenMP: a Standard for Directive based Parallel Programming – Applications of Parallel Programming - Matrix-Matrix Multiplication – Solving Systems of Equations – Sorting Networks - Bubble Sort Variations – Parallel Depth First Search		
Unit IV: DISTRIBUTED COMPUTING PARADIGM		9 Hrs
Paradigms for Distributed applications – Basic algorithms in Message passing Systems – Leader Election in Rings – Mutual Exclusion in Shared Memory		
Unit V: FAULT TOLERANT DESIGN		9 Hrs
Synchronous Systems with Crash Failures – Byzantine Failures – Impossibility in Asynchronous Systems - Formal Model for Simulation – Broadcast and Multicast – Specification of a Broadcast Service – Implementing a Broadcast Service – Multicast in Groups – Distributed Shared Memory – Linearizable – Sequentially Consistent Shared Memory – Algorithms		

Text Books:

1. Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar, "Introduction to Parallel Computing", Second Edition, Pearson Education, 2009.
2. Haggit Attiya and Jennifer Welch, "Distributed Computing – Fundamentals, Simulations and Advanced Topics", Second Edition, Wiley, 2012.
3. Michael Quinn, "Parallel Computing - Theory and Practice", Second Edition, Tata McGraw Hill, 2002.
4. Norman Matloff, "Parallel Computing for Data Science – With Examples in R, C++ and CUDA", Chapman and Hall/CRC, 2015.
5. Wan Fokkink, "Distributed Algorithms: An Intuitive Approach", MIT Press, 2013.
6. M.L. Liu, "Distributed Computing – Principles and Applications", First Edition, Pearson Education, 2011.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
CO2	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
CO3	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
CO4	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
CO5	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1
Avg	3	3	2	2	-	3	3	-	-	-	-	2	1	1	1

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 356	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	HUMAN RESOURCE MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To Understand the Human Resource Management concepts To Illustrate the applicability of the concept of organisational behaviour, its theories and models. 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1: Understand the key concepts, theories, and practices in the field of HRM</p> <p>CO2: Apply innovative solutions to the problems arises in Human Resource Management</p> <p>CO3: Apply various OB models to explain individual behaviour related to personality, perception and managing emotions</p> <p>CO4: Analyse the theories of motivation and acquire leadership skills</p> <p>CO5: Critically evaluate the group dynamics and demonstrate skills required for working in groups (team building)</p>		
<p>Pedagogy: Lectures, Seminars, Case studies and Assignment</p>		
<p>Unit I: CONCEPTS OF HUMAN RESOURCE MANAGEMENT</p>		7 Hrs
<p>Human Resource Management –Introduction and Importance- Conceptual difference between Personnel Management and HRM – role of a HR Manager. Human Resources Planning – Objectives - HRP Process –Manpower Estimation – Job analysis -job Description-Job Specification.</p>		
<p>Unit II: RECRUITMENT, TRAINING AND DEVELOPMENT</p>		9 Hrs
<p>Recruitment-Sources of Recruitment – Selection Process-Placement and Induction. Training and Development -Objectives and Needs - Training Process-Methods of Training-Tools and Aids - Evaluation of training Programs - Performance Management System - Definition, Concept and Ethics –Different methods of Performance Appraisal - Rating Errors – Competency Management.</p>		
<p>Unit III: CONCEPTS OF ORGANIZATIONAL BEHAVIOUR</p>		9 Hrs
<p>Fundamentals of Organizational Behaviour: Organisational behaviour -concept and significance; OB Models & Approaches, Work Force Diversity, Organizational Justice OB Trends. Individual Processes and Behaviour: organizational culture Personality and values, Perception, Attitude, Learning, Motivation, Managing Emotions and Stress Moods.</p>		
<p>Unit IV: MOTIVATION</p>		10 Hrs
<p>Motivation: Process of motivation; Theories of motivation - need hierarchy theory, theory X and theory Y, two factor theory, Alderfer's ERG theory, McClelland's learned need theory, Victor Vroom's expectancy theory - Leadership: Concept; Leadership styles; Theories.</p>		
<p>Unit V: GROUP DYNAMICS AND TEAM DEVELOPMENT</p>		10 Hrs
<p>Work Teams and Group dynamics -definition and importance, types of groups, group formation, group development, group composition, group performance factors; Principle-centered approach to team development. Organizational Culture and Climate, Organizational Change and Development, Cross Cultural Organizational Behaviour</p>		

Text Books:

1. Gary Dessler & Biju Varrkey, “Human Resource Management” ,Sixteenth Edition , Pearson - 2020
2. Griffin, Ricky W: Organisational Behaviour, Houghton Mifflin Co., Boston.
3. K Aswathappa and Sadhna Dash, Human Resource Management - Text and Cases | 9th Edition – 2021
4. Steers, Richard M. and J. Stewart Black: Organizational Behavior, Harper Collins College Publishers, New York. Sukla, Madhukar: Understanding Organisations: Organisation Theory and Practice in India, Prentice Hall, New Delhi.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1			2	3		3	3		2	2	3	3	3
CO2	3	2			2	3		3	3		2	2	3	3	3
CO3	3	2			2	3		3	3		2	2	3	3	3
CO4	3	3			2	3		3	3		2	2	3	3	3
CO5	3	3			2	3		3	3		2	2	3	3	3
Avg	3	2.2			2	3		3	3		2	2	3	3	3

*S-Strong (3)**M- Medium (2)**L- Low (1)*

Subject Code BTCB 357	Subject Title	L T P C 0 0 4 2
<i>Technical</i>	FINANCIAL ANALYSIS AND PLANNING LAB	<i>Skill Course</i>
Course Objectives:		
<ol style="list-style-type: none"> To provide students with a thorough understanding of personal financial management and planning, equipping them with the knowledge to manage income, investments, and debt efficiently. To develop students' skills in using financial tools and techniques for personal financial decision-making, wealth creation, risk management, and retirement planning. 		
Course Outcomes:		
On completion of the course, the students will able to:		
CO1. Identify the key concepts and components of personal financial management, including savings, investment avenues, and debt management		
CO2. Explain the time value of money, personal budgeting techniques, and the importance of wealth creation and retention through various investment tools		
CO3. Apply financial analysis techniques using spreadsheets to calculate the time value of money, manage personal investments, and create diversified investment portfolios		
CO4. Analyse personal financial risks and evaluate insurance products, risk management techniques, and debt management strategies for optimizing personal financial health		
CO5. Evaluate different personal financial planning tools, pension schemes, and retirement planning strategies to make informed financial decisions for long-term security		
Pedagogy: Lecture, Discussion, Case studies, presentation		
Unit I: Personal Financial Management		8 Hrs
Personal Financial Management – Meaning and various Components – Personal Income and Expenditure – Identifying and Reducing Unnecessary Personal Expenditure – Meaning and Types of Savings – Investment – Need for Investment – Types of Investment - Features and characteristics of all popular investment products available in India - case studies with real world examples		
Unit II: Personal Financial Planning		8 Hrs
Time value of Money – Present Value of Money, Future value of Money and Annuity calculations using Spreadsheets - case studies related to Time value of Money with real world examples and Time Value calculations using Spread sheets - Basics of personal financial planning - Personal Budgeting Preparation Using Spreadsheet and various Apps		
Unit III: Personal Investment Avenues		10 Hrs
Determination of Wealth - Tools and techniques to understand wealth creation and retention – Investment in Gold, Currency, Real Estate, Gold, Commodities, Stock market Etc., – case studies with real world examples and Trading – Career Opportunities in the securities market – Virtual and Real Time Trading and Investment using appropriate Tools and Techniques		
Unit IV: Personal Financial Risk Management		9 Hrs
Personal Financial Risk – Types of Risk - Tools and techniques to understand asset protection – Insurance management – various Insurance products – Selection best Insurance products - case		

studies with real world examples – Risk management through diversified Investment portfolio creation – **Portfolio creation using Money control, Stock Screener, Ticker Tape Etc.,**

Unit V: Personal Debt Management

10 Hrs

Personal Debt Management – Various types of personal loans – Evaluation and selection of personal loan – **case studies using Loan apps** – Credit and Debit card management – Buy now Pay Later Schemes – other credit schemes - Personal Income Taxes – Calculation of Personal Income Tax – **E-Filing of Income Tax and procedures** - Retirement Planning – various pension schemes – selection of pension schemes – Financial Planning using **Buddi and Home Bank (Open source Personal Finance Software)**

Text Books:

1. **Dr. Nilesh Uttamrao Bankar Dr. Mohsin Abbas Tamboli, “Personal Financial Planning”, Thakur Publication Pvt. Ltd.**
2. **Jack R. Kapoor Les R. Dlabay Robert J. Hughes Melissa. “Personal Finance” MC GRAW HILL INDIA**
3. Robert Kiyosaki’s “Rich Dad Poor Dad,"
4. Vicki Robin’s “Your Money or Your Life”
5. Chelsea Fagan and Lauren Ver Hage, “The Financial Diet,"

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 358	Subject Title	L T P C 3 0 0 0
<i>Technical</i>	CONSTITUTION OF INDIA	<i>Ability Enhancement</i>
Course Objectives:		
1. To learn about the Constitution of India and the structure.		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. To create the awareness of The Constitution.		
CO2. To understand the structures, roles and functions of the Union Government.		
CO3. To understand the structures, roles and functions of the State Government.		
CO4. To understand the structures, roles and functions of the Local Administration.		
CO5. To understand about the Election Commission.		
Pedagogy: <i>Lecture, assignments</i>		
Unit I: THE CONSTITUTION – INTRODUCTION		9 Hrs
The History of the Making of the Indian Constitution, Preamble and the Basic Structure, and its interpretation, Fundamental Rights and Duties and their interpretation- State Policy Principles.		
Unit II: UNION GOVERNMENT		9 Hrs
Structure of the Indian Union-President, Role and Power, Prime Minister and Council of Ministers, Lok Sabha and Rajya Sabha.		
Unit III: STATE GOVERNMENT		9 Hrs
Governor, Role and Power, Chief Minister and Council of Ministers, State Secretariat.		
Unit IV: LOCAL ADMINISTRATION		9 Hrs
District Administration, Municipal Corporation, Zila Panchayat.		
Unit V: ELECTION COMMISSION		9 Hrs
Role and Functioning, Chief Election Commissioner, State Election Commission.		
Text Books:		
1. Dr. B. Mahadevan, Chinmaya Vishwa Vidyapeeth, Dr. Vinayak Rajat Bhat, Dr. Nagendra Pavana R.N., Chinmaya Vishwa Vidyapeeth, Dr. Anil Sahasrabudhe, Subhash Kak, Dr. S. Sadagopan, “Introduction to Indian Knowledge System: Concepts and Applications”, IIT Bangalore, 2022.		
2. DD Basu Lexis Nexis, “Introduction to the Constitution of India”, 23rd Edition, 2018.		
3. B.L. Fadia Sahitya Bhawan, “The Constitution of India”, New Edition, 2017.		
4. Rajeew Bhargava, “Ethics and Politics of the Indian Constitution”, Oxford University Press, 2008.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CO2	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CO3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CO4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CO5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
Avg	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-

S-Strong (3)

M- Medium (2)

L- Low (1)

SEMESTER VI

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 361	Marketing Management	3-0-0-3
BTCB 362	Lean Start-Up Management	3-0-0-3
BTCB 363	Information Security with Lab	3-0-2-4
BTCB 364	Software Engineering and Agile Software Development with lab	3-0-2-4
BTCB 365	Information System Control and Audit	3-0-0-3
BTCB 7XX	Professional Elective - 1	3-0-0-3
BTCB 366	Mini Project	0-0-8-4
BTCB 367	Data Analytics lab (Skill Course)	0-0-4-2
Total Credits		26

NEP PU Guidelines

- ❖ Students who want to undertake 3-year UG programme will be awarded UG degree in the relevant discipline /subject upon securing 122 credits.
- ❖ A minimum of 12 credits will be allotted to the minor stream relating to vocational education and training spreading through 2, 3, 4 &5 semesters.
- ❖ Internship is included as the major 11 course.

Subject Code BTCB 361	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	MARKETING MANAGEMENT	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> To provide students with a deep understanding of marketing principles, strategies, and the role of marketing in business decision-making processes To develop the ability to analyse and apply marketing research, branding, and marketing ethics to address both local and international business challenges 		
Course Outcomes:		
On completion of the course the students will be able to:		
CO1. Understand the core concepts of marketing, including marketing mix, market segmentation		
CO2. Analyse the impact of macro and micro environmental factors on marketing strategies		
CO3. Apply branding strategies and principles of brand equity that can compete in global market		
CO4. Evaluate various marketing research techniques to assess market trends		
CO5. Create effective marketing strategies that incorporate ethical, social, and legal considerations		
Pedagogy: Lecture, Discussion, Case studies.		
Unit I: Introduction:		9 Hrs
Concept- nature- scope and importance of marketing; Marketing concept and its evolution; Marketing mix; Strategic marketing planning – an overview. Market Analysis and Selection: Marketing environment – macro and micro components and their impact on marketing decisions; Market segmentation and positioning-Buyer behavior-consumer versus organizational buyers-Consumer decision making process.		
Unit II: Introduction to brand management:		9 Hrs
Retailing Definition- Nature- Importance- The Retailing Environment- Economic Forces- Social Forces- Technological Forces- Competitive Forces- The Development of Retail Institution Dynamics of Institutional Change. Merchandise Planning Warehousing & Supply Chain Management- Role of IT in Supply Chain Management- Merchandise Flow- Online Logistics Management- Retail Pricing- Credit Management- Retail Promotion- Training to Staff- Employee Motivation- Organization Culture.		
Unit III: Introduction to brand Equity:		9 Hrs
Concept- nature- scope- importance- characteristics of branding. Brand origin- Branding and trademark. Brand Equity: Definition- Concept- Scope and Role of Brand Equity- Models- Building Brand Equity- Devising Brand Strategy- Managing Brand Equity- Measuring Brand Equity.		
Unit IV: Marketing Research:		9 Hrs
Meaning and scope of marketing research-Marketing research process-Marketing Organisation and Control: Organising and controlling marketing operations. Issues and Developments in Marketing: Social- ethical and legal aspects of marketing-Marketing of services-International marketing-Green marketing-Cyber marketing-Relationship marketing and other developments of marketing.		
Unit V: Issues and Developments in Marketing:		9 Hrs
Social- ethical and legal aspects of marketing-Marketing of services-International marketing-Green marketing-Cyber marketing-Relationship marketing and other developments of marketing. Export procedures: Advantages and Disadvantages of Exporting as a market Entry Strategy- Facilities and Incentives relating to export- Preliminaries for starting exports- Registration of Exporters- Sending overseas samples- Appointing overseas agents.		
Text Books:		
<ol style="list-style-type: none"> Kotlar Philip, Marketing Management, Prentice Hall, New Delhi. Stanton, Etzel, Walker, Fundamentals of Marketing, Tata-McGraw Hill, New Delhi. Saxena Rajan, Marketing Management, Tata-McGraw Hill, New Delhi. McCarthy E.J. Basic, Marketing: A managerial approach, Irwin, New York. Jaiswal Bimal, International Business, Himalyan Publishing Houser, Edition 2012. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	2	-	-	2	2	2	2	2	3	3
CO2	3	3	3	3	2	2	1	2	2	1	1	3	2	3	3
CO3	2	3	3	3	3	1	3	2	3	3	3	3	3	3	3
CO4	1	2	2	2	3	2	3	3	3	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	2	3	3	3	3	3	3
Avg	2.4	2.75	2.4	2.75	2.75	2	2.25	2.25	2.4	2.2	2.2	2.6	2.6	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject code BTCB 362	Subject Title	L T P C 3 0 0 3
Cognitive	LEAN START-UP MANAGEMENT	Major
Course Objectives:		
1. To enable the students to face the challenges of starting new ventures. 1. To acquire the students with necessary skills to start new business ventures		
Course Outcome:		
On completion of the course, the students will be able to		
CO1. Understand the required environment for startup ventures in India		
CO2. Acquire the necessary skill sets for starting new business		
CO3. Analyse suitable financial avenues		
CO4. Evaluate successful startup ventures and models		
CO5. Launch and manage a startup venture successfully		
Pedagogy: Lecture, Case discussion, Business Plan preparation, Idea Presentation, Brainstorming		
UNIT I: ENTREPRENEURIAL JOURNEY:		9 Hrs
Entrepreneurial Discovery -Myths of Entrepreneurship- Evaluating Entrepreneurial Career Options and Start-up Opportunities Overview of Entrepreneurship-What Does It Take to Be an entrepreneur? Evaluating New-Business Opportunities - Research & Analysis to Guide Your Start-up Strategy - The Entrepreneur's Role, Task and Personality - Defining Survival and Success		
UNIT II: ROLE OF GOVERNMENT:		9 Hrs
Government push for start-ups-facilities-training- approaching government-innovative ideas-different departments –SME-Ministry of company affairs –NITI Ayog-State government supports-licensing- various schemes		
UNIT III: STARTUP FINANCES AND CAPITAL REQUIREMENTS		9 Hrs
An Overview of Start-up Finances and Sources of Investment Capital - Developing- Financial Projections—How to Forecast Expenses and Revenue Case Discussion: Raising Seed Financing Workshop: Capitalization and Ownership for New Ventures		
UNIT IV: DEVELOPING AND PRESENTING STARTUP BUSINESS PLAN:		9 Hrs
The Venture Communication -Communication for Start-ups Examining Sample Business Plans and Executive Summaries Workshop: Business Plan Critique the Art of the Venture Presentation Developing Entrepreneurial Marketing: Competencies, Networks and Frameworks Gathering Resources		
UNIT V: LAUNCHING AND MANAGING THE STARTUP ENTERPRISE		9 Hrs
Maintaining Competitive Advantage the Changing Role of the Entrepreneur: Mid-Career Dilemmas What to Expect During the “Launch Stage” Where to Focus First? The Imperatives of the Launch Stage Legal Issues Facing Entrepreneur Building Your Team		
Text Books:		
1. Barringer, Bruce R., Ireland, R. Duane. Entrepreneurship: Successfully Launching New Ventures. United Kingdom: Pearson Education, 2019.		
2. Hisrich, Robert D., Ramadani, Veland. Effective Entrepreneurial Management: Strategy, Planning, Risk Management, and Organization. Germany: Springer International Publishing, 2016.		
3. Drucker, Peter. Innovation and Entrepreneurship. United Kingdom: Taylor & Francis, 2014.		
1. Timmons, Jeffry., Spinelli, Stephen. New Venture Creation: Entrepreneurship for the 21st Century. United Kingdom: McGraw-Hill Education, 2009.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	1	2	2	3	3	3	3	3	2
CO2	3	3	3	2	1	2	1	3	2	3	3	3	3	3	2
CO3	3	3	3	2	2	2	2	3	2	3	3	3	3	3	2
CO4	3	3	3	2	2	2	2	3	2	3	3	3	3	3	2
CO5	3	3	3	2	2	2	2	3	2	3	3	3	3	3	2
Avg	3	3	3	2	1.6	2	1.6	2.8	2	3	3	3	3	3	2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 363	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	INFORMATION SECURITY WITH LAB	<i>Major</i>
Course Objectives:		
<ul style="list-style-type: none"> 2. To study and practice fundamental techniques in developing secure applications 3. To understand the policy, procedures and guidelines to protect the computing resources 		
Course Outcomes:		
<p>On completion of the course, the students will be able to:</p> <p>CO1. Understand security parameters and access control methods.</p> <p>CO2. Identify the fundamental policies and design principle of computing resources</p> <p>CO3. Design information systems by incorporating the security policies</p> <p>CO4. Apply various security design principles</p> <p>CO5. Implement the security architecture for business systems</p>		
Pedagogy: Lecture, Discussion, Case studies, observations, presentation, Laboratory		
Unit I: Overview of Information Security:		9 Hrs
Importance of Information Security- Security Methodology. Risk Analysis: Threat - Types of Attacks - Secure Design Principles: The CIA Triad and Other models, Defense models - Security Policies, Standards, Procedures and Guidelines - Access Control Models - Authentication and Authorization.		
Unit II: Data, Network Security:		9 Hrs
Data Security - Encryption - Database Security - Security in Networks - Threats in Networks - Network Security controls.		
Unit III: Operating System Security, Program Security:		9 Hrs
Operating System Security – Operating system security models - Application Security - Secure Application Design - Secure Development Lifecycle - Application security practices.		
Unit IV: Security Technologies:		9 Hrs
Firewalls - Virtual Private Networks - Intrusion detection and Prevention Systems - E-mail Security.		
Unit V: Security Operations and Physical Security:		9 Hrs
Disaster Recovery, Business Continuity, Backups and High Availability - Incident Response - Forensic Analysis - Physical Security.		
Text Books:		
<ul style="list-style-type: none"> 2. Mark Rhodes - Ousley, "Information Security, The Complete Reference", Second Edition, 2013, McGraw Hill. 3. Margulies Jonathan., Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Pearson Education, 2015 4. Bishop, M. Computer Security: Art and Science. Pearson Education, Boston, 2018. 5. Stamp, M. Information security: principles and practice. John Wiley & Sons, 2014. 6. Howard, Michael., LeBlanc, David. Writing Secure Code. United States: Microsoft Press, 2002. 		

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Analysis of security policies in Unix/Linux/Windows.	3 hours
2	Administration of users, password policies, privileges and roles	3 hours
3	Eavesdropping Attacks and its prevention	3 hours
4	Implementation Encryption methods	3 hours
5	Implementation Decryption methods	3 hours
6	Design of Authentication systems	3 hours
7	Design of Authorization systems	3 hours
8	Basic defensive practice skills against malicious SQL injection attacks.	3 hours
9	Design a system to detect all the instances of an attack using signatures	3 hours
10	Design a system to detect all the instances of an attack in online	3 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3		2		2				2	2	3	2
CO2	3	2	3	2	2	2						2	2	3	2
CO3	2	3	2	2		2		3				3	3	3	2
CO4	3	3	2	2	3	3		3				3	2	2	2
CO5	3	3	3	3	3	3		3				3	3	3	3
Avg	2.6	2.6	2.6	2.4	1.6	2.4		2.2				2.6	2.4	2.8	2.2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 364	Subject Title	L T P C 3 0 2 4
<i>Technical</i>	SOFTWARE ENGINEERING AND AGILE SOFTWARE DEVELOPMENT WITH LAB	<i>Major</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To introduce the fundamental concepts of software development process. To illustrate the concepts of system analysis and design for system requirement specification 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand software engineering and agile principles.</p> <p>CO2. Elucidate the various software requirements for design and development.</p> <p>CO3. Analyze the business value of adopting agile approaches and agile development practices.</p> <p>CO4. Establish and mentor Agile Teams for effective software development.</p> <p>CO5. Apply core values and principles of Agile Methods in software development</p>		
<p>Pedagogy: Lectures, Assignments, Practical</p>		
<p>Unit I: SOFTWARE ENGINEERING</p> <p>Nature of Software, Software Engineering, Software process, project, product, Process Models Classical Evolutionary models, Software Process Models: Waterfall, V-model, Spiral, iterative & incremental - Component- based development, Fourth Gen Techniques</p>		9 Hrs
<p>UNIT II: SOFTWARE REQUIREMENTS ANALYSIS, DESIGN AND CONSTRUCTION</p> <p>Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modelling –requirements documentation through use cases- UML diagrams – Object Oriented Analysis, Design and implementation.</p>		9 Hrs
<p>Unit III: SOFTWARE PROJECT PLANNING</p> <p>Identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.</p>		9 Hrs
<p>Unit IV: AGILE SOFTWARE DESIGN AND DEVELOPMENT</p> <p>Agile Manifesto and Principles, Agile design practices, Refactoring Techniques, Continuous Integration, Automated build tools, Version control; Agility and Quality Assurance: Agile Interaction Design, Agile approach to Quality Assurance, Overview of Agile Development Models - Scrum, Extreme Programming, Feature Driven Development, Crystal, Kanban, and Lean Software Development.</p>		6 Hrs
<p>Unit V: SCRUM</p> <p>Agile Scrum Framework, Scrum Artifacts, Meetings, Activities and Roles, Scrum Team Simulation, Scrum Planning Principles, Product and Release Planning, Sprinting: Planning, Execution, Review and Retrospective; User story definition and Characteristics, Acceptance tests and Verifying stories, Burn down chart, Daily scrum, Scrum Case Study.</p>		12 Hrs

Text Books:

1. Roger S. Pressman, **Software engineering: a practitioner's approach, Palgrave macmillan, 7th Edition, 2017.**
2. Mike Cohen, **Succeeding with Agile: Software Development Using Scrum, Addison Wesley, 2009.**
3. Behforooz, A., and Hudson, F. J. **Software engineering fundamentals. Oxford University Press, Inc., 2018.**
4. Sommerville, I. **Software Engineering: Pearson New International Edition. Pearson Education Limited, 10th Edition, 2017.**
5. Schwaber, Ken, Beedle, Mike, **Agile Software Development with Scrum, Prentice Hall, 1st Edition, 2001.**

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Prepare a WBS for developing a customized social networking portal for our university.	4 hours
2	Using WBS estimate the effort that will be needed to finish the product. Also give a detailed cost estimation and budget for completing this project	4 hours
3	Identify the actors involved, modularize the problem, context of the modules. Draw refined structures of DFD and make a functional model of the system.	4 hours
4	Impart dynamism to the functional model, so that the system behaves in states and transition according to the requirements.	4 hours
5	Prepare the complete Software Requirement Specifications	4 hours
6	Detail the functional model of the system using UML diagrams in the context of Object Oriented Development.	6 hours
7	Evaluate the performance of the system in terms of load, stress, endurance and scalability.	4 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2					1	2		2	2	1
CO2	2	3	2	3	2				2	2	2		3	2	1
CO3	2	3	2	1	1				2	2	2		2	3	1
CO4	2	3	2	2	3				2	2	2		2	3	1
CO5	2	3	1	2	2						1		3	2	2
Avg	2	2.8	1.6	2	2				1.2	1.4	1.8		2.4	2.4	1.2

*S-Strong (3)**M-Medium (2)**L-Low (1)*

Subject Code BTCB 365	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	INFORMATION SYSTEM CONTROL AND AUDIT	<i>Major</i>
Course Objectives:		
1. To learn the audit and control aspects of information systems. 2. To provide knowledge on the management control framework, data resource management controls, application control framework and process controls		
Course Outcomes:		
On completion of the course, the students will be able to: CO1. Understand core concepts of information systems and their control techniques. CO2. Analyze and mitigate the risks associated with information systems using audit procedures. CO3. Apply principles of information security. CO4. Evaluate the effectiveness of information systems controls in supporting organizational processes and decision-making. CO5. Develop communication and documentation skills by preparing audit reports.		
Components of Teaching Type: Lecture, Discussion, Case studies, Assignments		
Unit I: OVERVIEW OF INFORMATION SYSTEMS AUDITING		9hrs
Need for Control and Audit of Computers–Effects of Computers on Internal Controls–Effects of Computers on Auditing –Foundations of Information Systems Auditing-Conducting Information Systems Audit–Audit risks–Types of Audit Procedures–Auditing around or through the computer.		
Unit: II: MANAGEMENT CONTROL STRUCTURES AND AUDITS		9hrs
Management Control Framework – Top Management Controls – Systems Development Management Controls–Programming Management Controls		
Unit III: SYSTEM CONTROL AND AUDITS		9hrs
Data Resource Management Controls–Security Management Controls–Operations Management Controls–Quality Assurance Management Control		
Unit IV: APPLICATION CONTROL AND AUDITS		9hrs
The Application Control Framework– Boundary Controls– Input Controls- Communication Controls.		
Unit V: PROCESS CONTROL AND OUTPUT CONTROL AUDITS		9hrs
Processing Controls– Database Controls– Output Control		
Text Books:		
<ol style="list-style-type: none"> Ron Weber, Information System Control and Audit, Prentice Hall, 2011 Dube, D.P. and Gulati V.P., Information System Audit and Assurance (Including Case Studies and Check lists from the Bank), Tata McGraw-Hill, 2005 Frederick Gallegos, Daniel P. Manson, Sandra Sen, and Carol Gonzales Gallegos, Information Technology Control and Audit, Auerbach Publications, 2004 Ed Danter, Auditing Information Systems and Controls: The only thing worse than no control is the illusion of control, Xlibris US, 2007 CA Chandan Patni, Information Systems Control & Audit, Taxmann Publications Pvt. Ltd., 2017. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	1	1	1	2	1	1	3	3	2
CO2	3	3	2	2	2	2	1	2	2	2	1	1	3	3	2
CO3	3	3	2	3	3	2	2	3	1	2	1	1	3	3	2
CO4	2	2	3	2	2	2	2	2	2	3	2	2	3	3	1
CO5	1	1	3	2	1	2	2	2	3	3	2	2	3	1	3
Avg	2.4	2.2	2.2	2	2	1.8	1.6	2	1.8	2.4	1.4	1.4	3	2.6	2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 366	Subject Title	L T P C 0 0 8 4
<i>Technical</i>	MINI PROJECT	Skill Course

Project Identification

- Broad area
- Tentative Title

Literature Review

- Evaluating the literature review (minimum 10 Research Documents).
 - Identifying the research gap.

Research Problem and Objectives

- Defining the research problem
- Formulating research questions and objectives

Methodology

- Explaining research methodology
- Relevance of methodology for the project.
- Data and their sources/ Test Data Design /Simulation
 - Experiment Design

Project Phase II Timeline

- Tentative timeline for the phase II indicating
- Time for Data Collection, analysis, interpretation, implementation, writing, and report

Weightage for the evaluation of Project - Phase I

Sl. No	Components	Weightage (%)
1.	Project Identification	15
2.	Literature Review	25
3.	Research questions and Objectives	25
4.	Methodology	25
5.	Project Phase II Timeline	10

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO2	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO3	3	3	3	3	3	3	3	2	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
Avg	3	3	3	2.6	2.6	3	2.6	2.4	2.4	3	1.6	1.6	2.6	2.6	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 367	Subject Title	L T P C 0 0 4 2
<i>Technical</i>	DATA ANALYTICS	Skill Course
Courses Objectives:		
1. To familiarize basic concepts of Data Analytics 2. To aid the student to implement analytic algorithms and graphical interpretation of Data		
Course Outcomes:		
On completion of the course, the students will be able to: CO1: Understand basic concepts of data analytics CO2: Perform data manipulation and data cleaning process CO3: Demonstrate data visualization concepts and techniques CO4: Apply data analytics techniques CO5: Develop recommendation system for business problems		
UNIT I: INTRODUCTION TO DATA ANALYTICS		6 Hrs
Data and its significance, Data Analytics and its types, Significance of analytics in Business environment – Interrelation between Statistics, Analytics and Data Science, Python for Data Analytics.		
UNIT II: DATA CLEANSING AND MANIPULATION		6 Hrs
Cleansing Data with Python - Data Manipulation steps- Data manipulation tools - Python Built-in Functions - User Defined Functions in Python - Stripping out extraneous information - Normalising data and Formatting data - Python Packages for data manipulation.		
UNIT III: DATA ANALYSIS AND VISUALIZATION		6 Hrs
Exploratory data analysis - Descriptive statistics, Frequency Tables - Univariate Analysis - Bivariate Analysis – Creating Visualizations – Python Packages for Exploratory Analysis and Data Visualization.		
Unit IV: DATA ANALYTICS AND PREDICTIVE MODELLING		6 Hrs
Statistical learning vs. Machine learning - Iteration and evaluation - Major Classes of Learning Algorithms - Different Phases of Analytics, concepts of under fitting, Performance Metrics - Types of Cross validation. Predictive Modelling Basics - Types of Business problems – Mapping Techniques - Linear Regression - Logistic Regression - Segmentation - Cluster Analysis - Decision Trees - Time Series Forecasting.		
UNIT V: PRESCRIPTIVE ANALYTICS		6 Hrs
Significance of prescriptive analytics - Decision making – Multi-criterial decision making – case-based reasoning – Heuristics – Optimization, Case Example - Recommendation system.		
Text Books:		
<ol style="list-style-type: none"> 1. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython Second Edition, 2017. 2. Rudolph Russell, Machine Learning: Step-by-Step Guide To Implement Machine Learning Algorithms with Python 2018. 3. Alvaro Fuentes, Hands-On Predictive Analytics with Python: Master the complete predictive analytics process, from problem definition to model deployment, Packt Publishing, 2018. 4. Fabio Nelli, Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python, APress, 2015. 5. Hayden Van Der Post, Prescriptive Analytics: Prescribe with Python: The Definitive Prescriptive Analytics Python Guide, Reactive Publishing, 2023. 		

LIST OF INDICATIVE EXPERIMENTS

Sl.No	Experiments	Hours
1	Forecasting Future Cash flow	5
2	Forecasting Sales trends	5
3	Predicting consumer behaviour in retail	5
4	Algorithmic Recommendation system	5
5	Detecting fraudulent financial transactions	5
6	Investment Decision support system	5
	<i>TOTAL LABORATORY HOURS</i>	30

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		2		1			1			3	3	2
CO2	3	3	2	3	3		2			1			3	3	3
CO3	3	3	3	3	3		2			2			3	2	2
CO4	3	2	3	3	3				1	1		2	2	2	1
CO5	3	2	3	2	3		2			2		3	3	3	2
Avg	3	2.4	2.6	2.8	2.8		1.8		1	1.4		2.5	2.8	2.6	2

S-Strong (3)

M-Medium (2)

L-Low (1)

SEMESTER VII

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 471	Advanced Financial Analysis and Planning Lab	0-0-4-2
BTCB 472	Security Analysis and Portfolio Management	3-0-2-4
BTCB 473	Strategic Management	3-0-0-3
BTCB 7XX	Professional Elective - 2	3-0-0-3
BTCB 7XX	Professional Elective - 3	3-0-0-3
BTCB 7XX	Open Elective – 1	3-0-0-3
BTCB 474	Seminar	0-0-2-1
BTCB 475	Capstone Project -I / Internship	0-0-12-6
Total Credits		25

Subject Code BTCB 471	Subject Title	L T P C 0-0-4-2
<i>Technical</i>	ADVANCED FINANCIAL ANALYSIS AND PLANNING	<i>Major</i>
Learning Objectives:		
<ol style="list-style-type: none"> To provide advanced knowledge and skills in financial analysis, focusing on corporate financial planning and data visualization using various software tools such as Power BI, Tableau, and Google Charts. To develop students' ability to create and interpret financial dashboards, enhancing their decision-making capabilities through data-driven insights and storytelling techniques. 		
Learning Outcome:		
On completion of the course, the students will able to:		
CO1. Identify the key functionalities of spreadsheet tools and data visualization software, such as Power BI, Tableau, and Google Charts, for advanced financial analysis		
CO2. Explain the process of preparing financial data visualizations and dashboards using software tools, including the significance of data interpretation in corporate financial planning		
CO3. Apply data visualization techniques to financial datasets, creating charts, graphs, and dashboards using tools such as RAWGRAPHS, Power BI, and Tableau to facilitate data-driven decision-making		
CO4. Analyse financial data through various data visualization methods, assessing the impact of different visual representations on corporate financial decision-making and strategy development		
CO5. Evaluate the effectiveness of data visualization tools and techniques in providing actionable insights for financial planning and performance monitoring in real-world business		
Pedagogy: <i>Lectures, Practical, Seminars, Assignments, Quiz, Project, Case Study</i>		
Unit I:		9 Hrs
Corporate Financial Analysis and Planning using SPREAD SHEET		
Unit II:		9 Hrs
Data visualisation and preparation of various charts using RAWGRAPHS		
Unit III:		7 Hrs
Data visualisation and preparation of various charts using GOOGLE CHARTS		
Unit IV:		10 Hrs
Data Visualisation and Dashboard creation using POWER BI		
Unit V:		10 Hrs
Data Visualisation and Dashboard creation using TABLEAU		
Text Books:		
<ol style="list-style-type: none"> Steve Wexler, Jeffrey Shaffer, and Andy Cotgreave, “Visualize Your Data Using Real-World Business Scenarios”, Wiley Marco Russo, Alberto Ferrari, “Analyzing Data with Microsoft Power BI And Power Pivot For Excel”, PHI Cole Nussbaumer Knaflic, “Storytelling with Data: A Data Visualization Guide for Business Professionals”, Wiley Stephen Few, "Information Dashboard Design: Displaying Data for At-a-glance Monitoring” Perceptual Edge, Chandraish Sinha, “Mastering Power BI” , BPB publications 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3		3	3	1	1	1	2	1		1	3	3	2
CO2	1	3		3	3	1	1	1	2	1		1	3	3	2
CO3	2	3		3	3	2	2	2	2	2		2	3	3	2
CO4	2	3		3	3	2	2	2	2	2		2	3	3	2
CO5	2	3		3	3	2	2	2	2	2		2	3	3	2
Avg	1.6	3		3	3	1.6	1.6	1.6	2	1.6		1.6	3	3	2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 472	Subject Title	L T P C 3 0 2 4
<i>Cognitive</i>	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	<i>Major</i>
Course Objectives:		
1. To provide basics of investment analysis and portfolio management 2. To expose the relevant the knowledge and skills for valuation and pricing of securities		
Course Outcome:		
On completion of the course, the students will be able to:		
CO1. Understand the concepts of investment analysis and portfolio management		
CO2. Measure the risk return profile of the various securities		
CO3. Apply suitable methods and techniques for fundamental and technical analysis		
CO4. Construct optimal investment and portfolios		
CO5. Evaluate the portfolio performances		
Pedagogy: Lecture, problem solving, case study discussion		
Unit I: Basics of Investment		10 Hrs
Meaning–Features-Alternatives-Investment, Speculation and Gambling–Indian Capital Market–Primary Market and Secondary Markets–Processes of Buying and Selling Securities–Secondary Markets–Types–Stock Exchanges– OTCEI–Depository– Role of SEBI in security markets.		
Unit II: Risk–Return Framework		7 Hrs
Security Returns–Measurement of Returns–Risk Systematic and Unsystematic Risk- return calculation of risk return using MS-Excel.		
Unit III: Fundamental Analysis and Technical Analysis		10 Hrs
Meaning–Importance–Objectives–Analysis-Economic, Industry and Company–Financial and Non-Financial Parameters–Technical Analysis: Meaning–Difference between fundamental analysis and Technical analysis- TheDowTheory–Technical indicators–ChartingTechniques–Stock market indicators– Market Efficiency: Weak form– Semi-strong form– Strong form– valuation equity.		
Unit IV: Portfolio Analysis		8 Hrs
Portfolio Returns and Risk–Mean Variance Criterion– Markowitz Diversification–Efficient Frontier–Dominance Principle–Optimum Portfolio – Utility Theory. Determination of Efficient Frontier using Excel.		
Unit V: Asset Pricing Models		10 Hrs
Capital Market Theory–Capital Asset Pricing Model (CAPM) –Assumptions–Inputs - Capital Market Line–Security Market Line– Fama – French models CAPM anomalies. Arbitrage pricing theory – Zero beta CAPM. Beta estimation technique using MS-Excel.		
Text Books:		
1. Fisher & Jordan, “Portfolio Management”, Prentice Hall, New York, 2012 2. Reilly Brown, Investment Analysis and Portfolio Management, Cengage Learning 8 th Edition. 2006 3. Prasanna Chandra, “Investment Analysis and Portfolio Management”, Tata McGraw Hill, New Delhi, Third Edition 2006. 4. Elton, Edwin J and Gruber, Martin J., “Modern Portfolio Theory and Investment Analysis”, John Wiley, 2001.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3	3	2	-	-	-	2	2	3	3	3	3
CO2	3	3	1	3	3	2	-	-	-	2	2	3	3	3	3
CO3	3	3	1	3	3	2	-	-	-	2	2	3	3	3	3
CO4	3	3	1	3	3	2	-	-	-	2	2	3	3	3	3
CO5	3	3	1	3	3	2	-	-	-	2	2	3	3	3	3
Avg	3	3	1	3	3	2	-	-	-	2	2	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 473	Subject Title	L T P C 3-0-0-3
<i>Cognitive</i>	STRATEGIC MANAGEMENT	<i>Major</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. To understand the strategic management process and design suitable strategy 2. To identify and connect the strategy to achieve the organisational vision and mission 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the concepts of strategy for various organisations</p> <p>CO2. Scan the environment for the organisation</p> <p>CO3. Analyse strategic options and choices for the organisations</p> <p>CO4. Evaluate and implement Strategies</p> <p>CO5. Develop suitable control mechanism to achieve the organisational vision and mission</p>		
<p>Pedagogy: Lecture, Discussion, Case studies, observations, presentation, role plays, problem and games</p>		
<p>Unit-I: Introduction to Strategy:</p> <p>Concept of strategy and strategic management; Strategic Management Model - Strategic management process – Strategic intent, vision, mission, objectives, policies – Strategic management process – Levels of strategy – Ethics and social responsibility- Industry and Competitive Analysis.</p>		8 Hrs
<p>Unit- II Environmental Analysis and Appraisal</p> <p>External Analysis - Industry analysis, remote environment analysis, competitive analysis, global environmental analysis. Internal Analysis- Resource and Capabilities, core competence, value chain analysis, VRHN analysis, distinctive competency, sustainable competitive advantage and profitability.</p>		8 Hrs
<p>Unit- III Strategic Analysis and Choice:</p> <p>Corporate level strategies- Grand strategies -growth, stability, retrenchment, combination - SWOT Analysis - PESTEL Analysis, BCG, TOWS, GE, Directional Policy Matrix- Strategic Advantage Profile - McKinsey’s7s Framework - Business Level Strategies- Michael Porter’s Generic strategies, Functional level strategies.</p>		14 Hrs
<p>Unit-IV: Strategy Implementation:</p> <p>Structure, System and People -Leadership and culture – Implementation models - Project implementation, Procedural implementation, Resource Allocation, and Budgets - Strategies for competing in global markets – organizational ethics, values and its impact on Strategy.</p>		7 Hrs
<p>Unit-V: Strategy Evaluation and Control</p> <p>Establishing strategic controls - Operations Control and Strategic Control - Measuring performance – Qualitative and quantitative benchmark - Analyzing variances - Strategic information systems – Strategic surveillance -strategic audit.</p>		8 Hrs
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Parnell, John A.. Strategic Management: Theory and Practice. United States: SAGE Publications, 2013. 2. Hill, Charles W. L, Jones, Gareth R. Strategic Management Theory: An Integrated Approach. Brazil: Cengage Learning, 2012. 		

3. Michael E. Porter :Competitive Strategy: Techniques for Analyzing Industries and Competitors
4. Hitt, Michael A. Ireland., Manikutty, S. Strategic Management: a South-Asian Perspective (with CourseMate). India: Cengage South-Western, 2015.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1	1	1	2		3	3	3	3	3
CO2	3	3	3	3	3	1	1	1	2	2	3	3	3	3	3
CO3	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
Avg	3	3	3	3	3	1.6	2	2.2	2	2.8	3	3	3	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

1. Review of Literature**2. Objective of Project****3. Analysis & Design**

- Statistical/Mathematical/System Analysis
- Experiment/ System Design

Weightage for the evaluation of Project - Phase I

Sl. No	Components	Weightage (%)
1.	Review of Literature	20
2.	Objective of Project	20
3.	Analysis	20
4.	Design	20
5.	Viva	20

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO2	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO3	3	3	3	3	3	3	3	2	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
Avg	3	3	3	2.6	2.6	3	2.6	2.4	2.4	3	1.6	1.6	2.6	2.6	2.6

*S-Strong (3)**M- Medium (2)**L- Low (1)*

SEMESTER VIII

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 481	Blockchain and Cryptocurrencies	3-0-0-3
BTCB 482	Big Data and Cloud Computing	3-0-2-4
BTCB 7XX	Professional Elective - 4	3-0-0-3
BTCB 7XX	Open Elective -2	3-0-0-3
BTCB 7XX	Open Elective -3	3-0-0-3
BTCB 483	Capstone Project -II	0-0-12-6
BTCB 484	Internship	0-0-2-1
Total Credits		23

NEP PU Guidelines

- ❖ Students will be awarded UG degree (honours) with research in the relevant discipline /subject provided they secure 164 credits
- ❖ Honours students not undertaking research will do 3 courses for 12 credits in lieu of a research project / dissertation.
- ❖ Students of UG honours with research will choose a research component in the 4th year and complete research methodology courses and advanced courses in major/minor.

Subject Code BTCB 481	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	BLOCKCHAIN AND CRYPTOCURRENCIES	<i>Major</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. To familiarize the basic concepts of Blockchain Technology, Cryptocurrency, cryptographic algorithms. 2. To introduce applications of Blockchain to cryptocurrencies and to analyze the limitations of current Blockchain 		
<p>Course Outcome:</p> <p>On completion of the course, the students will able to:</p> <p>CO1: Understand the fundamental concepts of Cryptography, Blockchain technology, and Cryptocurrencies.</p> <p>CO2: Analyze the methods of mining transactions in blockchain, and cryptocurrencies.</p> <p>CO3: Examine Consensus mechanisms and smart contracts algorithms</p> <p>CO4: Build Smart contracts for different business usecases.</p> <p>CO5: Synthesize the implementation of Blockchain Technology for solving the real time problems.</p>		
<p>Pedagogy: <i>Lecture, Assignments, Case Studies.</i></p>		
<p>UNIT I: FUNDAMENTALS OF BLOCKCHAIN AND CRYPTOGRAPHY 9 Hrs</p> <p>Cryptographic: Hash Functions - Hash Pointers and Data Structures, Digital Signatures, Public keys as Identities, Application of Cryptography to Blockchain–Using hash functions to chain blocks-Digital signatures to sign transactions –hash functions for Proof-of-Work.-Putting the technology together-examples of implementations with their trade-offs.</p>		
<p>UNIT II: BLOCKCHAIN TECHNOLOGY 9 Hrs</p> <p>Advantage of Blockchain over conventional distributed database - Blockchain Evolution- Transactions and Blocks - Block chain network, Mining, types of blockchain - Merkle Patricia Tree -Transactions - Anonymity.</p>		
<p>UNIT III: DISTRIBUTED CONSENSUS AND SMART CONTRACTS 9 Hrs</p> <p>Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus with- out identity using a blockchain, Incentives, Distributed Virtual Machines, Smart Contracts, Trust in Algorithms, Integration with existing legal systems- Open Zeplin, Open Law.</p>		
<p>UNIT IV: BITCOIN, ETHERUEM AND ALT COINS 9 Hrs</p> <p>Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language, Etheruem, Smart contracts, Smart contracts to enforce legal contracts, Bitcoin scripting vs. Etheruem Smart Contracts, Smart contracts using Solidity, JavaScript - A Few Altcoins in Detail, Merge Mining-Atomic Crosschain –Sidechains.</p>		
<p>UNIT V: APPLICATIONS AND CHALLENGES 9 Hrs</p> <p>Applications of blockchain in cyber security, integrity of information, E-Governance and other contract enforcement mechanisms – Integration with IoT, AI. Challenges in Blockchain technology.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. (2016). Bitcoin and Cryptocurrency technologies: a comprehensive introduction. Princeton University Press. 2. Imran Bashir, Mastering Blockchain, Second Edition (2018), Packt Publication. 3. Antonopoulos, A. M. (2014). <i>Mastering Bitcoin: unlocking digital cryptocurrencies.</i> OReilly Media, Inc.”. 4. Franco, P. (2014). <i>Understanding Bitcoin: Cryptography, engineering and economics.</i> John Wiley 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	2	-	-	-	-	1	3	2	1
CO2	3	2	2	2	2	2	3	-	-	-	-	1	3	3	1
CO3	3	3	3	2	2	2	3	-	-	-	-	1	3	3	1
CO4	3	3	3	3	2	2	3	-	-	-	-	2	3	3	2
CO5	3	3	3	3	2	2	3	-	-	-	-	2	3	3	2
Avg	3	2.6	2.6	2.2	2	2	1.4	-	-	-	-	1.4	3	1.8	1.4
	<i>S-Strong (3)</i>			<i>M-Medium (2)</i>				<i>L-Low (1)</i>							

Subject Code BTCB 482	Subject Title	L T P C 3 1 0 4
Technical	BIG DATA AND CLOUD COMPUTING	Major
Course Objectives:		
<ol style="list-style-type: none"> To understand the computational approaches to big data analytics To provide an in-depth and comprehensive knowledge of the cloud computing. 		
Course Outcomes:		
On completion of the course, the students will able to:		
CO1: Understand the fundamental concepts of big data and cloud computing.		
CO2: Analyze and apply data storage techniques and technologies.		
CO3: Implement big data processing frameworks.		
CO4: Utilize cloud computing platforms.		
CO5: Develop a comprehensive understanding of current trends, tools, and technologies.		
Pedagogy: Lecture, Practical, lab assignments		
Unit I: BIG DATA MINING DATA STREAMS		9hrs
Big Data Platform – Intelligent data analysis – Analytic Processes and Tools - Analysis vs Reporting. Stream Data Model and Architecture - Stream Computing - Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform Applications		
Unit II: HADOOP AND SPARK		9hrs
Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop-Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - MR Types and Formats- MR Features. Spark.		
Unit III: FRAMEWORKS		9hrs
Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM Info Sphere BigInsights and Streams. visualization techniques		
Unit IV: CLOUD COMPUTING		9hrs
Cloud Computing- Properties - Characteristics - Service models, Deployment models. Cloud resources: Network and API - Virtual and Physical computational resources - Data-storage. Virtualization concepts - Types of Virtualization- Introduction to Various Hypervisors - High Availability /Disaster Recovery using Virtualization, Moving VMs .		
Unit V: CLOUD COMPUTING APPLICATIONS GOVERNANCE		9hrs
Cloud Programming and Software Environments – Parallel and Distributed Programming paradigms – Amazon AWS and Microsoft Azure – Google App Engine – Emerging Cloud software Environment. Organizational Readiness and Change Management in the Cloud Age, Legal Issues in Cloud Computing, Achieving Production Readiness for Cloud Services		
Text and Reference Books:		
<ol style="list-style-type: none"> Comer, Douglas. The Cloud Computing Book: The Future of Computing Explained. United Kingdom: CRC Press, 2021. Big Data Analytics: Harnessing Data for New Business Models. United States: Apple Academic Press, 2021. 		

3. Frank J Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, Wiley and SAS Business Series, 2013.
4. Colleen Mccue, “Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis”, Elsevier, Second Edition, 2015.
5. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		2		1			1			3	3	2
CO2	3	3	2	3	3		2			1			3	3	3
CO3	3	3	3	3	3		2			2			3	2	2
CO4	3	2	3	3	3				1	1		2	2	2	1
CO5	3	2	3	2	3		2			2		3	3	3	2
Avg	3.0	2.4	2.6	2.8	2.8		1.8		1.0	1.4		2.5	2.8	2.6	2.0

S-Strong (3)

M-Medium (2)

L-Low (1)

1. Analysis & Design

- Statistical/Mathematical/System Analysis
- Experiment/ System Design

2. Results

- Results Visualization & Reporting
- Results Consolidation.

3. Discussions

- Research Outcome
- Policy Implications

4. Documentation

- Preparation Report
- Developing a research Paper or Policy Document
- Paper presentation in National/International Conference/Seminar

Weightage for the evaluation of Project - Phase II

Sl. No	Components	Weightage (%)
1.	Analysis & Design	20
2.	Results	20
3.	Discussions	20
4.	Documentation/Result	20
5.	Viva	20

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO2	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO3	3	3	3	3	3	3	3	2	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
Avg	3	3	3	2.6	2.6	3	2.6	2.4	2.4	3	1.6	1.6	2.6	2.6	2.6

*S-Strong (3)**M-Medium (2)**L-Low (1)*

M.B.A – BANKING TECHNOLOGY
SEMESTER IX

COURSE CODE	COURSE TITLE	L-T-P-C
BT CB 591	Banking Technology Management	3-0-2-4
BT CB 592	Banking Operations Management	3-0-0-3
BT CB 593	Risk Management in Banks	3-0-0-3
BT CB 594	International Banking and Forex Trade	3-0-2-4
BT CB 595	Business Intelligence in Banking	3-0-0-3
BT CB 596	Digital Transformation for Banks	3-0-0-3
BT CB 597	Digital Assets Management	3-0-0-3
Total Credits		23

Subject Code BTCB 591	Subject Title	L T P C 3-0-2- 4
<i>Technical</i>	BANKING TECHNOLOGY MANAGEMENT	<i>Major</i>
Course Objectives: <ol style="list-style-type: none"> 1. To introduce the concept of Core Banking and the Technologies involved in it. 2. To explore Banking Channels, Payments gateways and settlement systems. 		
Course Outcomes: On completion of the course the students will be able to: CO1. Understand the components of CBS. CO2. Interpret practical knowledge of Digital Banking channels. CO3. Implement the various payment and settlement systems used in Banking and its uses. CO4. Examine the risks associated with banking operations at back-end. CO5. Demonstrate about the modern delivery channels.		
Pedagogy: Lecture, Assignment and Laboratory		
UNIT I: Branch Operation and Core Banking		9 Hrs
Introduction and Evolution of Bank Management- Reports - Technological Impact in Banking Operations– Total Branch Computerization – CBS– Concept, Opportunities .– Uses of CBS India – across the globe – A case study of recent CBS, e.g., BaNCs, Finacle, etc. – CBS components and its functionalities - Network architecture – ATM- data transfer interface –security architecture – Analysis of current CBS.		
UNIT 2: Digital Banking Channel		9 Hrs
Background – Business Models – Technology Models - Overview of delivery channels – Automated Teller Machine (ATM) – Phone Banking –Call centers – Internet Banking – Mobile Banking- micro ATM. Digital Wallets – Bank Wallets – Private Wallets Payment Gateways. Other Digital Payment Systems -Electoral bond – e-money, e-wallets, e-cheques -Crypto-currencies.		
UNIT 3: Payment and Settlement Systems		9 Hrs
Payment Systems Interbank Payment Systems – INFINET and NPCINet - Interface with Payment system Network– SWIFT- Structured Financial Messaging system (SFMS) - NEFT – RTGS; National Payments Corporation of India (NPCI) – Functions & Products – NFS - UPI – BHIM – NACH – IMPS - *99# – NETC – AEPS – BBPS - Bharat QR Code - Card technologies (RuPay), e-RUPI, CTS and Settlement Process.		
UNIT 4: Digital Banking – Back-office operations		9 Hrs
Data management – Risk management – Security and privacy of Information management – Treasury management system - asset and liability management system, and Forex management system.		
UNIT 5: Other Developments		9 Hrs
Modern Delivery Channels – Drone-based payments -Open Banking models – Neo banking Models -Virtual banking models - Security aspects of digital banking systems – Revolution of Banking systems using modern technologies– Smart Payment system models.		
Text and Reference Books: <ol style="list-style-type: none"> 1. Kaptan SS & Choubey N S., E-Indian Banking in Electronic Era, Sarup & Sons, New Delhi, 2013. 2. Vasudeva, E-Banking, CommonWealth Publishers, New Delhi, 2010 		

3. Banking Technology – Indian Institute of Bankers Publication,2010
4. SengLoke, Auerbach, Context-Aware Pervasive Systems: Architectures for a New Breed of Applications, 2013

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Mobile Banking Functions	6 hours
2	Internet Banking Functions	6 hours
3	ATM Functions	6 hours
4	Banking Middleware Functions	6 hours
5	Neo Banking Functions	6 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1	-	-	-	-	-	1	2	2	2	2
CO2	2	3	2	3	3	3	-	-	-	-	3	2	3	2	2
CO3	2	3	2	3	3	3	-	-	-	-	3	2	2	3	3
CO4	2	3	2	3	3	3	-	-	-	-	3	2	3	3	3
CO5	2	3	2	3	3	1	-	-	-	-	3	2	3	3	3
Avg	2	2.8	2	2.6	2.6	2	-	-	-	-	2.6	2	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 592	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	BANKING OPERATIONS AND MANAGEMENT	<i>Major</i>
Course Objectives:		
1. To expose various functional aspects of commercial banking in India 2. To facilitate the understanding of banking principles and practices in practical banking environment		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Understand the regulatory and operational aspects of banking business		
CO2. Acquire the required skill sets for a banking professional		
CO3. Apply the knowledge and skills in practical banking		
CO4. Evaluate various deposits, lending operations, and documentations requirements		
CO5. Design Prudential norms and practices across various banking activities		
Pedagogy: Lecture, Discussion, Case studies, Presentation, Role plays		
Unit- I: Introduction:		8 Hrs
Regulatory Environment for a Commercial bank in India and Basel Norms – Major products and Services - Ancillary services – Financial Inclusion - Emerging technologies in banking – products and services, payment and settlement, banking supervision, reporting and management.		
Unit- II: Operational Aspect of Commercial Banks:		11 Hrs
Relationship between banker and customers, Types of the customer account, Negotiable Instruments- Cheque, Endorsement, Dishonour - Bills of Exchange, Bills discounting and purchasing - Promissory notes - Rights and Liabilities of Paying and Collecting Banker, Time Value of money.		
Unit- III: Lending of Loans and Advances:		10 Hrs
Concept of Credit – Credit Policy – Credit Monitoring – Production Vs Consumption credit - Credit Instruments/ Products – Credit Facilities – Fund and Non-Fund – Priority Sector lending – Sectoral financing – Retail, Consumer, Agriculture, SMEs, SHGs, SSI, Tiny - Consortium Financing – Credit rating and CIBIL Procedures.		
Unit- IV: Securities and Modes of Charges:		8 Hrs
General principles - Secured Vs. unsecured - Collateral securities - Advances against title of goods/ ornaments/ securities/ book debts etc., Modes of Charges: loan/ pledge/ hypothecation and mortgages – Guarantees and surety - Documentation procedures and Stamping		
Unit –V: Prudential Norms:		8 Hrs
IRAC Norms – Capital Adequacy Norms – Asset Liability Management - Exposure Norms for loans and investments - Off balance sheet exposure - Management of NPA and Recovery - Lok Adalat, DRT, SARFESI and IBC – Prompt Corrective Action.		
Text Books:		
1. Bimal Jaiswal, Banking Operation Management, Vikas publishing house, 2015. 2. Johannes Wernz, Bank Management and Control, 2nd Edition, 2020. 3. IIBF, Advanced Bank Management, 3rd Edition, MacMillan Education. 2015 4. IIBF, Bank Financial Management, 3rd Edition, MacMillan Education. 2015		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		2	2	1	1	1	1	1	2	2	3	2	2
CO2	3	3		2	2	1	1	1	1	1	2	2	3	2	2
CO3	3	3		3	3	2	2	2	2	2	3	3	3	3	3
CO4	3	3		3	3	2	2	2	2	2	3	3	3	3	3
CO5	3	3		3	3	2	2	2	2	2	3	3	3	3	3
Avg	3	3		2.6	2.6	1.6	1.6	1.6	1.6	1.6	2.6	2.6	3	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 593	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	RISK MANAGEMENT IN BANK	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To expose the various types of credit risk in banks To analyze and understand the market risks in banks and the control measures for various risks. 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the concepts of Risk and its policy framework for banks</p> <p>CO2. Demonstrate the skills sets required for Credit Risk Management.</p> <p>CO3. Identify the various operations risk for banks.</p> <p>CO4. Analyze the risks associated with the market changes.</p> <p>CO5. Apply control measures to overcome the risks involved in banks.</p>		
<p>Pedagogy: Lectures, Case studies, Assignments and mini projects</p>		
<p>Unit I: Introduction and Overview:</p> <p>Risk definition – Basel Committee Norms – Risk Process- Risk Organization and policy – Important risks in commercial banks – Regulatory Framework and RBI guidelines - Liquidity Risk Management and Asset Liability Management.</p>		9 Hrs
<p>Unit II: Credit Risk:</p> <p>Credit risk framework - RBI guidelines - Risk rating and risk pricing - Credit risk assessment - Standardized approach and Advanced approach - Credit rating /scoring - Credit Bureaus - Stress test and sensitivity analysis - Internal Capital Adequacy Assessment Process (ICAAP) - Structured products.</p>		9 Hrs
<p>Unit III: Operational Risk:</p> <p>Operational risk framework - Types of operational risk - Causes for operational risk - Sound Principles of Operational Risk Management (SPOR) - Identification, measurement, control / mitigation of operational risks- Organizational set up and Policy requirements- Strategic approach and key responsibilities of ORM - Capital allocation for operational risk, methodology and qualifying criteria for banks for the adoption of the methods; Computation of capital charge for operational risk.</p>		9 Hrs
<p>Unit IV: Market risk:</p> <p>Interest rate risk - Price risk (Equity) - Commodity risk - Currency risk – Managing Market risk - Measuring Market risk under Basel- Standardized duration method- Internal measurement approach – Value at Risk (VaR) – Equity Risk Premium (ERP)</p>		9 Hrs
<p>Unit V: Risk Measurement, Control and Management:</p> <p>Risk Calculation - Risk exposure analysis - Prudential norms – Income Recognition and Asset Classification (IRAC) norms -Capital adequacy norms - Hedging – Forwards – Futures – Options Arbitrage opportunities -Regulatory prescriptions of risk management - Systems Audit - Risk Organization and Policy.</p>		9 Hrs
<p>Text Books:</p> <ol style="list-style-type: none"> Foundations of Banking Risk: An Overview of Banking, Banking Risks, and Risk-Based Banking Regulation. Germany: Wiley, 2014. 		

2. Choudhry, Moorad. **Bank Asset and Liability Management: Strategy, Trading, Analysis.** Germany: Wiley, 2011.
3. John C. Hull, Risk Management and Financial Institutions , Pearson, 2009
4. Indian Institute of Banking and Finance(IIBF), Risk Management , Macmillan Publishers India, 2010

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	2	2	-	-	-	-	2	2	2	2
CO2	3	2	-	-	-	2	2	-	-	-	-	2	2	2	2
CO3	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
CO4	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
Avg	2.8	2	-	-	-	2	2	-	-	-	-	2	2.6	2.6	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 594	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	INTERNATINAL BANKING AND FOREX TRADE	<i>Major</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To equip students with an interdisciplinary knowledge of engineering and business, fostering their ability to solve complex global challenges in banking, finance, and technology To enable students to develop innovative, sustainable solutions using data-driven decision-making, engineering principles, and managerial strategies, contributing to societal and environmental well-being. 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will able to:</p> <p>CO1. Identify and analyse the complex dynamics between global banking regulations, financial systems, and their societal impact, leveraging both engineering and business frameworks</p> <p>CO2. Design and develop solutions for interdisciplinary challenges in banking and finance using modern tools and technologies, while considering sustainability and ethical implications</p> <p>CO3. Evaluate international banking operations and risk management strategies through the lens of contemporary regulations</p> <p>CO4. Apply advanced financial and managerial tools to solve problems in international money markets, foreign exchange, and global business environments, promoting sustainable practices</p> <p>CO5. Communicate technical and managerial concepts effectively across multidisciplinary teams</p>		
<p>Pedagogy: Lecture, Case studies, Assignments and mini projects</p>		
<p>Unit I: International Banking:</p> <p>Origin and Evolution of International banking–Global trends as reasons for growth of international banking–financial activity following real-sector transactions– Regulatory, Tax and Supervisory explanations– Definitions– Growth and future prospects of International banking–Need for regulation of international banking in the current scenario. The World Bank Group– International Bank for Reconstruction and Development (IBRD)– IDA– IFC– MIGA– International Monetary Fund(IMF) in brief–Lending facilities– BIS–ADB.</p>		<p>9 Hrs</p>
<p>Unit II: Global Business Environment:</p> <p>World Economy–Developing and Developed Nations–Trade between countries–Trade Blocks and Regional Economic Cooperation– World Bank–IMF–WTO– Growths of Multinationals –Globalization. International Financial System–Euro Currency Markets– International Money Market–Euro Bonds– FRN– Medium Term notes. Global Capital Markets: International Equity Trading– Instruments– structure and Regulations of International Equity and Bond Markets– New Issue procedure– Linkages between Domestic, Eurobond Secondary Markets. International Credit Policy Agencies and Global Capital Markets</p>		<p>9 Hrs</p>
<p>Unit III: The Foreign Exchange Market:</p> <p>Organisation–Spot Vs Forward Markets–Bid and ask rates– Interbank Quotations– International Market Quotations–Cross Rates–Merchant Rates–FEDAI Regulations–Role of RBI. Exchange Rates–Exchange rate systems–Gold Standard–Bretton Woods–Fixed Vs Floating Exchange Rate systems–Determinants of Exchange Rates–Exchange Controls. Project and infrastructure Finance: Investments both in India (FII & FDI) and abroad, Joint ventures abroad by Indian Corporates. Investment opportunities abroad for resident Indians.</p>		<p>9 Hrs</p>
<p>Unit IV: International Banking, Legal And Regulatory Aspects:</p> <p>Regulatory Framework-BASEL Norms-International law-choice of law-conflict of laws-jurisdictional issues-Exchange management and controls-International loan agreements-covenants and clauses, Country risk and bank risk management-International debt management-Role of IMF and World Bank</p>		<p>9 Hrs</p>

in International debt crisis management-Anti-money laundering laws-Maritime frauds-modus operandi and prevention initiatives, **International competitiveness** – implications and effectiveness, International accounting standards, Arbitration and mediation in International banking business.

Unit V: International Banking Operations:

9 Hrs

Off-shore financial centres– Rationale–Characteristics of offshore financial centres–Types of offshore centres–Benefit and reasons for growth–Factors of success–
Tax Havens– Major Offshore Financial Centres– International Banking facilities–Special Economic Zones(SEZs)–Regulatory concerns– **Origin and Growth of Correspondent banking**– Challenges for correspondent banking–clearing house functions–payments and collections–credit services– foreign Exchange services–other facilities.

Text Books:

1. A.W. Mullineux & Victor Murinde. Handbook of International Banking. Edward Elgar
2. Cheol Eun & Bruce G. Resnick. (2012). International Financial Management, McGraw Hill
3. Indian Institute of Banking & Finance. International Banking Operations. Macmillan Publishers
4. Jane Hughes & Scott MacDonald. (2002). International Banking: Text and Cases. PI
5. 2. Ian H Giddy, “Global Financial Markets”, AITBS Pub, Delhi 11 051.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO2	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO3	3	3	3	3	3	3	3	2	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
Avg	3	3	3	2.6	2.6	3	2.6	2.4	2.4	3	1.6	1.6	2.6	2.6	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 595	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	BUSINESS INTELLIGENCE IN BANKING	<i>Major</i>
Course Objectives: <ol style="list-style-type: none"> 1. To understand data extraction, transformation and loading process 2. To learn how to use knowledge discovery techniques for making decisions in business 		
Course Outcomes: On completion of the course, the students will able to: CO1: Understand the basic concepts of business intelligence CO2: Apply ETL processes and data warehousing techniques CO3: Design and implement data analysis models using tools. CO4: Identify patterns and make predictions from large datasets. CO5: Implement business intelligence systems that align with organizational goals.		
<i>Pedagogy: Lecture, Practical, Assignment</i>		
Unit I: BUSINESS INTELLIGENCE		9hrs
Business Intelligence - Definition, Architecture, benefits of BI - Intelligence creation and use of BI governance - Transaction processing versus analytic processing, BI implementation – Developing BI Solution, Justification and Cost-benefit analysis, Security and protection of privacy, Integration of systems and applications, BI tools and techniques.		
Unit II: DATA WAREHOUSING – ETL		9hrs
Data Warehousing – Definition, and concepts, Characteristics, Data marts, Operational data stores, Enterprise DW, metadata, Architectures. Process - Data integration - ETL. Data warehouse development – Vendors, Development approaches, Representation of data in data warehouse, OLAP Vs OLTP, OLAP operations – implementation, administration and security issues in DW.		
Unit III: DATA MINING PROCESS		9hrs
Data preprocessing - Feature Selection - Dimensionality Reduction - Regression, Multiple Regression & Model building, Discretization and Generating Concept Hierarchies – Mining Frequent Patterns, Associations and Correlation – Frequent Itemset Mining Methods – Constraint-Based Association Mining – Multidimensional Association		
Unit IV: CLASSIFICATION		9hrs
Classification: Classification, Issues, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Back Propagation, Support Vector Machines, Association Classification, Lazy Learners, Ensemble Methods, Performance Measures		
Unit V: CLUSTERING:		9hrs
Clustering Concepts, Similarity Methods : Partitioning Methods: k-means, Hierarchical Methods: Distance-based Agglomerative and Divisible Clustering, Density-Based Methods, Model-Based Methods: Expectation Maximization, Grid Based Methods, Constraint-Based Cluster Analysis, Outlier Analysis, Clustering large database. BI use-cases.		
Text and Reference Books:		
<ol style="list-style-type: none"> 1. Han, Jiawei., Pei, Jian., Tong, Hanghang. Data Mining: Concepts and Techniques. Netherlands: Elsevier Science, 2022. 2. Kimball, Ralph; Reeves, Laura et al, “Data warehouse lifecycle toolkit: Expert methods for designing, developing, and deploying data warehouses”, John Wiley & Sons, 2012. 		

3. Paulraj Ponniah, — Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley Publications, 2014.
4. Turban, E., Sharda, R., Delen, D. and King, D., Business Intelligence- A Managerial Approach, Pearson Education, New Delhi, 2012.
5. Sonar, R.M., Next generation Business Intelligence – A Knowledge Based Approach, VIKAS Publications, New Delhi, 2011.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	-	-	-	-	-	1	2	2	2	2
CO2	2	3	2	3	3	-	-	-	-	-	3	2	3	3	2
CO3	2	3	2	3	3	-	-	-	-	-	3	2	3	3	3
CO4	2	3	2	3	3	-	-	-	-	-	3	2	2	3	3
CO5	2	3	2	3	3	-	-	-	-	-	3	2	3	2	3
Avg	2	2.6	2	2.6	2.6	-	-	-	-	-	2.6	2	2.6	2.6	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 596	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	DIGITAL TRANSFORMATION FOR BANKS	<i>Major</i>
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To identify key drivers of technology's impact on the business ecosystem. To comprehend the current and contemporary technologies in transforming business 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Describe the underlying economics of innovation, technology, and market disruptions.</p> <p>CO2. Elucidate the need for Digital transformations in Banks.</p> <p>CO3. Under the various digital business models.</p> <p>CO4. Analyze the various digital technologies applicable for digital transformation in Banks.</p> <p>CO5. Apply skills to incorporate digital disruption in business planning capabilities and implement digital transformation.</p>		
<p>Pedagogy: Lecture, Discussion, Case studies, Assignments</p>		
<p>Unit I -Digital Disruption and Digital Transformation Imperative</p> <p>Getting Out of the Digital Terminology, Understanding Digital Disruption, The Digital Business and Digital Transformation Imperatives. Forming and Executing Digital Transformation Strategy, Digital Transformation standards and policies</p>		9 Hrs
<p>Unit II -Leadership and Management of Digital Transformation</p> <p>Building and Leading the Digital Transformation Team, The Digital Disruption and Digital Transformation of management, Keeping Up with the Pace of Technology Changes, Digital Transformation Strategy and Digital Business Strategy Capabilities.</p>		9 Hrs
<p>Unit III - Understanding Digital Business Capabilities</p> <p>Digital Innovation, Digital Learning, and Adaptability/Agility Capabilities, Digital Customer/ stakeholder Experience and Engagement. Enterprise Architecture Management, DT Adoption and Use, and Data Management/ Data Analytics/Data Science Capabilities, Cybersecurity and risk management, Digital Governance, Digital Leadership and Accelerated Change/ Transformation Capabilities.</p>		9 Hrs
<p>Unit IV - Understanding Digital Technologies – Data science and IoT</p> <p>Big Data, and Data Management, Business Intelligence, Data Analytics, and Data Science, Internet of Things (IoT), Industry 4.0, Smart Things, and Edge Computing, Artificial Intelligence, Blockchain and Other Distributed Ledger Technologies. .</p>		9 Hrs
<p>Unit V- Understanding Digital Technologies - Contemporary Technologies</p> <p>Video Content Analytics, Computer Vision, and Machine Vision, Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) Primer, Robots and Robotics, Drones, 3D and 4D Printing Primer, Cellular Networks up to 6G, GPS and Low Earth Orbit Satellites, IoT Connectivity like NBIoT, LPWAN Technologies, NFC technologies and Other Communication Protocols.</p>		9 Hrs
<p>Text Books and reference Books</p> <ol style="list-style-type: none"> Navigating Digital Transformation in Management (1st ed.). Richard Busulwa, Taylor & Francis, 2022. The Digital Business Transformation Playbook, David.L.Roges, Columbia University Press, 2016 Digital Business Transformation: How Established Companies Sustain Competitive Advantage From Now to Next, Nigel Vaz, John Wiley & Sons, 2021. 		

4. Industry 4.0: managing the digital transformation, Ustundag, Alp, and Emre Cevikcan. Springer Nature, 2018.
5. Driving Digital: The Leader's Guide to Business Transformation Through Technology

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5		3	3	2	2	2.7	2.5	2.7	3	3
	<i>S-Strong (3)</i>					<i>M-Medium (2)</i>				<i>L-Low (1)</i>					

Subject Code BTCB 597	Subject Title	L T P C 3-0-0-3
<i>Cognitive & Technical</i>	DIGITAL ASSETS MANAGEMENT	<i>Major</i>
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To provide students with a comprehensive understanding of digital assets, decentralized finance (De-Fi), blockchain technology, cryptocurrencies, NFTs, and Web3, preparing them for managing digital assets in modern financial ecosystems. To develop students' practical skills in trading, managing, and securing digital assets using blockchain, cryptocurrency platforms, and digital asset management software. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <p>CO1. Identify the various types of digital assets, including cryptocurrencies, NFTs, and their management platforms such as DAM (Digital Asset Management) software</p> <p>CO2. Explain the concepts of decentralized finance (De-Fi), peer-to-peer electronic cash systems, and blockchain technology and their significance in modern finance</p> <p>CO3. Apply blockchain technology and cryptocurrency trading techniques to create and manage a crypto portfolio, perform crypto mining, and manage digital transactions using tools like MetaMask and Coinbase</p> <p>CO4. Analyse the role of NFTs and Web3 in the digital economy, including the creation and marketing of NFTs and the application of Web3 in cryptocurrency, finance, and metaverse platforms</p> <p>CO5. Evaluate the use of DAM software and dematerialization processes in the secure storage and management of digital assets and securities, comparing platforms like NSDL and CDSL for market security</p>		
<p>Pedagogy: Lectures, Practical, Seminars, Assignments, Quiz, Project, Case Study</p>		
<p>Unit I: Digital Assets and De-Fi</p>		<p>9 Hrs</p>
<p>Meaning of Digital Assets and various Examples – Types of Digital Assets – Converting / Creating Digital Assets – Management of Digital Assets.</p> <p>De-Fi system - Centralised vs De-Centralised Financial System – Merits of De-Fi - Meaning of Currency and evaluation of currency system - Types of Modern currency – Fiat Currency vs Digital currency – Problems in the existing currency system and the Need for DE-FI – Liquidity pools and Deep drive – Liquidity mining and Liquidity mining rewards– LP Token (Liquidity Provider Token) Application of Pancake Swap - Digital Currency and CBDC</p>		
<p>Unit II: P2P Electronic cash system and Crypto Currency</p>		<p>9 Hrs</p>
<p>Santoshi Nakamoto's Peer- to Peer Electronic Cash system - Crypto Currency – Digital Vs Crypto Currency – Creation of Crypto currency – How does Crypto currency works? – Blockchain Technology and its characteristics – How does a Blockchain works? –Crypto mining - Programs used for Blockchain Development – Types of Blockchain- Blockchain applications in Finance – Leading Blockchain Development and Applications in Banking and Finance – Blockchain Technology Forum and other organisations.</p>		
<p>Unit III: Crypto Trading System</p>		<p>9 Hrs</p>
<p>Various Types of Crypto currencies – Popular Crypto currencies in India – Bitcoin Vs Ethereum – Smart Contract and its applications - various Crypto Exchanges and its Trading list and Statistics – Binance Vs Wazirx – meaning of Stable Coin – Creation of Crypto Portfolio – APR vs APY (Annual percentage Rate vs Annual percentage yield) List of Companies Accepted Crypto currency – P2P payment system – Role of MetaMask – De-Fi lending and De-Fi lending Exchanges – De-Fi lending smart contracts – Application of Coinbase wallet & Uniswap – Loop ring wallet</p>		

Unit IV: NFT and WEB3	9 Hrs
<p>Meaning of NFT – How does NFT works? - Creation of NFT - Various Types of NFT – Marketing of NFT – OPENSEA, BINANCE NFT, RARIBLE, THETADROP, NBA TOPSHOT, WAZIRX Etc., Marketing of NFT using TWITTER, TELEGRAM, INSTAGRAM Etc., Sales Analysis few Top Traded NFT.</p> <p>WEB3 and its Applications – WEB3 and Blockchain - WEB3 and Crypto – WEB3 and NFT – WEB3 and Metaverse – Building WEB3 with Java Script, Cloudflare (Open source template) Etc.,</p>	
Unit V: Dematerialisation and DAM Software	9 Hrs
<p>Dematerialization of Market Securities - DEMAT Process - Benefits of DEMAT – Role of Depository and Depository Participants – NSDL vs CDSL</p> <p>Digital Assets Management Software (DAM) – How DAM Software works – Benefits of DAM – Various DAM Software – IBM’s DAM solutions.</p>	
Text Books:	
<ol style="list-style-type: none"> 1. Campbell R. Harvey, Ashwin Ramachandran, et al. “De FI and the future of finance”, Wiley publication 2. Dave Shamrock and Justin Sonnen, “Decentralized Finance (DEFI) & Metaverse For Beginners” Amazon 3. Rajesh Dhuddu, Srinivas Mahankali, “Blockchain A to Z” bpb publications 4. Roy Ishan, “Blockchain Development for Finance Projects”, Packt Publishing Limited 5. Qu Harrison Terry and Matt Fortnow, “ The NFT Handbook” Wiley publications 	

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5		3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

SEMESTER X

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 598	Critical Thinking and Problem Identification / Research Methodology	3-1-0-4
BTCB 599	Internship / Research Project	0-0-36-18
Total Credits		22

Subject Code BTCB 598	Subject Title	L T P C 3-1-0-4
<i>Cognitive & Technical</i>	CRITICAL THINKING AND PROBLEM IDENTIFICATION	<i>Skill Course</i>
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To develop students' ability to think critically and analytically, enabling them to identify, define, and approach complex problems with well-reasoned solutions. To equip students with practical problem-solving skills and personal management techniques, fostering their capability to implement solutions effectively in real-world business environments. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <p>CO1. Define the key concepts of critical thinking, problem identification, and reasoning, and recognize their importance in business decision-making</p> <p>CO2. Explain the relationship between critical thinking, creative thinking, and strategic thinking, and how they contribute to problem-solving in various business contexts</p> <p>CO3. Apply problem-solving techniques to identify, analyse, and develop solutions for business problems, using structured methods such as SQ4R and reasoning frameworks</p> <p>CO4. Analyse the underlying causes of problems and evaluate potential solutions, taking into account risk factors, reasoning, and contextual influences on decision-making</p> <p>CO5. Evaluate the effectiveness of implemented solutions by assessing their feasibility, logic, and impact on business processes, making adjustments as needed for improvement</p>		
<p>Pedagogy: Lectures, Practical, Seminars, Assignments, Quiz, Project, Case Study</p>		
<p>Unit I: Critical Thinking</p> <p>Meaning of Thinking – Need for Thinking – Correlation between Intellect with the Thinking Activities – Levels of Thinking – Critical Thinking – Ways of Improving Critical Thinking – Context and Thinking Maps & Evaluating Inferences – Critical Thinking vs Creative Thinking – Critical Thinking vs Strategic Thinking - Role of Analytical Thinking in Critical Thinking – Implementation of SQ4R Approach (Survey, Question, Read, Recite, Review, and wRite)</p>		9 Hrs
<p>Unit II: Problem Solving Skills</p> <p>Problem Identification and Definition – Ways of Identifying Problems – Analysing the potential causes – Identifying and Selecting the best solutions – Developing an Action plan – Implementing Solutions – Evaluating the Progress - Developing Problem solving Skills</p>		9 Hrs
<p>Unit III: Personal Skills</p> <p>Soft skills required for Critical Thinking – Self- Management – Time Management – Grooming for various occasions – Learning from own action – Assertiveness – Team Management – Playing the role of team members – Recognising the needs of others – Predicting the Risk – Risk mitigation steps – Innovative ideas – Group Discussion -</p>		8 Hrs
<p>Unit IV: Application of Reasoning and other Skills</p> <p>Introduction to reasoning – Premises in reasoning – Data and source of data as the strengths of the reasoning – Analysing and Evaluating Reasoning - Role of Analytical thinking in critical thinking – How to do the analytical thinking – Exercises for developing reasoning skills – Constructing Reasoning.</p>		9 Hrs
<p>Unit V: Design and Implementation of Solutions (Problem Solving)</p> <p>Evaluating a solution - Considering the history of problem, logic/reasoning behind the solution, the feasibility of the solution, and the impacts of the solution -Implementing a solution in a manner that addresses thoroughly and deeply multiple contextual factors of the problem.</p>		10 Hrs

Text Books:

1. Paul, R. W., & Elder, L. (2002). **Critical Thinking: Tools For Taking Charge Of Your Professional and Personal Life.** USA: Prentice Hall.
2. Fisher, A. E. **Critical Thinking: An Introduction.** Cambridge: CUP
3. Thomson, A. **Critical Reasoning: A Practical Introduction.** New York: Routledge.
4. Krulik S and J.Rudnick, “Problem solving A Hand Book for Teachers, Creative Publications

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5		3	3	2	2	2.7	2.5	2.7	3	3

*S-Strong (3)**M-Medium (2)**L-Low (1)*

Subject Code BTCB 598	Subject Title	L T P C 3-1-0-4
<i>Cognitive</i>	RESEARCH METHODOLOGY	<i>Skill Course</i>
Course Objectives: 1. To introduce the basic concepts of Research Methodology 2. To impart the knowledge and improve the skills to apply research methods in business.		
Course Outcomes: On completion of the course, the students will be able to: CO1. Remember the concepts and statistical techniques for business CO2. Understand the concept and process of research methodology CO3. Apply the relevant statistical methods to find solutions for business problems CO4. Analyse and interpret the results for meaningful understanding and decision making CO5. Evaluate the outcomes for necessary future actions		
Pedagogy: Lecture, Problem Solving, and Case Study Analysis		
Unit I Introduction to Research		6 Hrs
Science and Research: Definition – History – Evolution of Scientific Inquiry, Scientific Research: Definition, Characteristics, types, need of research. Research Design.		
Unit II Research Methodology and Design		8 Hrs
Introduction to Research Methodology Meaning and importance of Research – Types of Research – Selection and formulation of Research Problem Research Design – Need – Features –Sample Designs. Analysis of Literature Review –Primary and Secondary Sources, Web sources Hypothesis –Deductive-Inductive– Different types of inductive logical methods.		
Unit III Data Analysis and Interpretation		15 Hrs
Data Collection and Analysis Sources of Data – Primary, Secondary and Tertiary – Types of Data – Categorical, nominal & Ordinal. Methods of Collecting Data : Observation, field investigations, Direct studies – Reports, Records or Experimental observations. Sampling methods – Data analysis and Methodology, Generalization and Interpretation – Modelling.		
Unit IV Report Writing		8 Hrs
Scientific Writing Structure and components of Scientific Reports – types of Report – Technical Reports and Thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports - Illustrations and tables – Bibliography, Referencing and foot notes –Research papers for journals, Project Proposal - Presenting a paper in scientific seminar, Thesis writing., Pictures and Graphs, citation styles, writing a review of paper, Bibliography		
Unit V Computer Applications and Statistics		8 Hrs
Use of word processing spreadsheet and database software. Plotting of graphs. Internet and its application: E-mail, WWW, Web browsing, acquiring technical skills, drawing inferences from data, Introduction to Statistics – Probability Theories - Conditional Probability, Poisson distribution, Binomial Distribution and Properties of Normal Distributions, Estimates of Means and Proportions; Chi Square Test, Association of Attributes t Test –Anova, Standard deviation Coefficient of variations. Correlation and Regression Analysis.		
Text Books:		
1. Kothari, C. R.. Research Methodology: Methods and Techniques. India: New Age International (P) Limited, 2004. 2. Creswell, John W., and Cheryl N. Poth. Qualitative inquiry and research design: Choosing among five approaches. Sage publications, 2016.		

3. Garg, Bhanwar Lal. Introduction To Research Methodology. India: RBSA Publishers, 2002.
4. Levin. Richard. I and Rubin. David. S 'Statistics for Management' Prentice-Hall, 8th Edition. 2017

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	3			1	1		1	1		3	2
CO2	2	3	3	3	3			1	1		1	1		3	2
CO3	2	3	3	3	3			3	2		2	2		3	2
CO4	2	3	3	3	3			3	2		2	2		3	2
CO5	2	3	3	3	3			3	2		2	2		3	2
Avg	2	3	3	3	3			2.2	1.6		1.6	1.6		3	2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 599	Subject Title	L T P C 0 0 36 18
<i>Technical</i>	RESEARCH PROJECT	Major
<p>The Final Research/Internship Project has two Phases.</p> <p>Phase I:</p> <p>In case of Research Project, students under the guidance of Faculty in-charge(s) of the given project work, carry out the background work, identify a tentative Title for the Project work, Review 20-25 Research papers, prepare a Review Paper.</p> <p>In case of Industry Project, students under the guidance of Faculty in-charge(s) and Industry Guide of the undertaken project work, carry out the background work, identify a tentative Title for the Project work, review technical documents, prepare a Proposal Paper.</p> <p>A public presentation on broad areas of proposed work to be made by students before starting II phase. Presentations would be evaluated by the Committee of Internal Faculty</p> <p>Phase II:</p> <p>Midterm and Final review to be evaluated by the Committee of Internal Faculty based on the work carried out by the students by presenting their work. The division of Marks for Phase I and Phase II components are 40% and 60% respectively.</p> <ul style="list-style-type: none"> ● Final Project Work must be in the inter-disciplinary area of Banking/Finance and IT. ● Students should be in regular contact with their faculty guide(s) 		

Subject Code BTCB 599	Subject Title	L T P C 0 0 36 18
<i>Technical</i>	INTERNSHIP	Major

Students should submit a draft of the Industry Project Report by the First week of April.

Final Project Report must contain the following Components: (75-100 Pages)

1. Title Page (Soft Binding)
2. 4- 5 Chapters (Back ground work, Methodology/Algorithm/Mathematical Model)
3. The final project report should be prepared by following the template provided by the department.

M.B.A – FINANCIAL TECHNOLOGY
SEMESTER IX

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 591	Financial Technology Management	3-0-2-4
BTCB 592	Digital Business Models	3-0-0-3
BTCB 593	Entrepreneurship in Fintech	3-0-0-3
BTCB 594	Project Planning and Financing	3-0-0-3
BTCB 595	Applied Financial Analytics	2-0-2-3
BTCB 596	International Finance and Forex Trade	3-0-2-4
BTCB 597	Business Intelligence	2-0-2-3
Total Credits		23

Subject Code BTCB 591	Subject Title	L T P C 3- 0- 2 - 4
<i>Technical</i>	FINANCIAL TECHNOLOGY MANAGEMENT	<i>Major</i>
Course Objectives:		
1. To learn the various Financial Payments, digital and alternative finance. 2. To expose the various regulators for Fintech and Data privacy regulations.		
Course Outcomes:		
On completion of the course the students will be able to: CO1. Understand about the Fintech evolution and current status. CO2. Interpret practical knowledge of Fintech payment methods. CO3. Implement the various digital and alternative finance methods. CO4. Examine the regulations and its ecosystem for Fintech Institutions. CO5. Demonstrate about the Data and privacy regulation.		
Pedagogy: Lecture, Assignment and Laboratory		
Unit I: FinTech Introduction		9 Hrs
Transformation – FinTech Evolution: Infrastructure, Banks Start-ups and Emerging Markets - Collaboration between Financial Institutions and Start-ups –FinTech Typology – Emerging Economics: Opportunities and Challenges - 8 From too-Small-To-Care to Too-Big-To-Fail – Introduction to Regulation Industry - The Future of RegTech and other Technologies Impacting it.		
Unit II: Payments		9 Hrs
Payments, Crypto currencies and Blockchain – Introduction - Individual Payments –Digital Financial Services – Mobile Money – Regulation of Mobile Money – SFMS - RTGS - NEFT –NDS Systems – Crypto currencies – Legal and Regulatory Implications of Crypto currencies – Blockchain – The Benefits from New Payment Stacks.		
Unit III: Digital Finance and Alternative Finance		9 Hrs
Financial Innovation – Digitization of Financial Services - FinTech & Funds- Crowd funding– Regards, Charity and Equity - P2P and Marketplace Lending – New Models and New Products – ICO.		
Unit IV: FinTech Regulation and RegTech		9 Hrs
FinTech Regulations Evolution of RegTech – RegTech Ecosystem: Financial Institutions – RegTech Ecosystem Ensuring Compliance from the Start: Suitability and Funds – RegTech Start-ups: Challenges – RegTech Ecosystem: Regulators Industry – Use Case of AI in Smart Regulation and Fraud Detection – Regulatory Sandboxes – Smart Regulation – Redesigning Better Financial Infrastructure.		
Unit V: Data & Tech		9 Hrs
Data Regulation – Data in Financial Services –Application of Data Analytics in Finance - Methods of Data Protection: GDPR Compliance and Personal Privacy – How AI is Transforming the Future of FinTech – Digital Identity – Change in mindset: Regulation 1.0 to 2.0 (KYC to KYD) - AI & Governance – New Challenges of AI and Machine Learning - Challenges of Data Regulation - Data is the New Oil: Risk of Breach – The Future of Data-Driven Finance - Case Studies.		
Text and Reference Books:		
1. Agustin Rubini, Fintech in a Flash: Financial Technology Made Easy, Zaccheus, 3rd Edition, 2018 2. Susanne Chishti and Janos Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, John Wiley, 1st Edition, 2016.		

3. Theo Lynn, John G. Mooney, Pierangelo Rosati, Mark Cummins, *Disrupting Finance: FinTech and Strategy in the 21st Century*, Palgrave, 1st edition, 2018

4. Abdul Rafay, *FinTech as a Disruptive Technology for Financial Institutions*, IGI Global, January, 2019

5. Bernardo Nicoletti, *The Future of FinTech: Integrating Finance and Technology in Financial Services*, Palgrave Macmillan, August, 2018

Indicative Laboratory Exercises: **30 Hrs**
 Design and Develop the Financial Software Prototypes with the following functionalities using the appropriate technologies:

- including Digital Payment and Blockchain based Secured Payment
-

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Micro Finance functions	6 hours
2	Crypto currency functions using Blockchain	6 hours
3	P2P Lending Functions	6 hours
4	Regulatory Sandboxes	6 hours
5	Smart RegTech using AI	6 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	-	-	-	-	-	1	2	2	2	2
CO2	2	3	2	3	3	2	-	-	-	-	3	2	3	3	3
CO3	2	3	2	3	3	2	-	-	-	-	3	2	2	3	3
CO4	2	3	2	3	3	2	-	-	-	-	3	2	3	3	3
CO5	2	3	2	3	3	2	-	-	-	-	3	2	3	2	2
Avg	2	2.6	2	2.6	2.6	2	-	-	-	-	2.6	2	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 592	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	DIGITAL BUSINESS MODELS	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> To impart the digital transformation and stages To impart digital emerging business models 		
Course Outcomes:		
On completion of the course, the students will able to:		
CO1. Understand Various digital developments		
CO2. Explore the concepts of agile and digital economy.		
CO3. Develop Digital business model and apply		
CO4. Analyze the organisation structure and roles.		
CO5. Apply the digital business strategy for real time cases.		
Components of Teaching Type: Taught courses		
UNIT I: INTRODUCTION TO DIGITAL TRANSFORMATION:		9 Hrs
Digital economy and key concepts- Key actors and stakeholders in the digital economy - The emergence of new digital spaces and business models -Introduction to Business Models-Traditional Business Models-Elements of the digital business model- introduce innovative digitally enhanced value to non-digital business		
UNIT II: PLATFORMS IN A DIGITAL ECONOMY:		9 Hrs
Introduction to Agile- Roadmap of Agile Transformation -Disruptive Technologies & Their Transformation Potential- Platforms and The Business Concepts That Underpin Their Success-Internet Business Models- Social media platforms- Knowledge platforms- Media sharing platforms- Service-oriented platforms		
UNIT III DIGITAL BUSINESS MODELS:		9 Hrs
Developing Digital Business Model- Open-source model- Free Model-Freemium Model-Subscription-based model-On-demand model-Peer-to-peer, two-sided marketplace-E-commerce model-Ad-supported model-Hidden revenue generation model		
UNIT IV ORGANISATION STRUCTURE AND LEADERSHIP ROLES:		9 Hrs
Understanding Change- Impact of digital technologies on organizational structure- Leadership- Culture - Operating model - Digital talent- leadership- and skills -and the changing landscape- Leading Disruptive Change - Agile management practices -Agile Culture & Leadership- Roles of managers and leaders		
UNIT V: DIGITAL BUSINESS STRATEGY:		9 Hrs
Data-Driven Framework - Digital Operations- Digital competitive advantage -strategy for the digital consumer journey- Data and Technology Driven Marketing- Agile Marketing- AI-powered Marketing		
Text Books:		
<ol style="list-style-type: none"> Westerman, George., Bonnet, Didier., McAfee, Andrew. Leading Digital: Turning Technology Into Business Transformation. United States: Harvard Business Review Press, 2014. Gupta, Sunil. Driving Digital Strategy: A Guide to Reimagining Your Business. United States: Harvard Business Review Press, 2018. Gale, Michael., Aarons, Chris. The Digital Helix: Transforming Your Organization's DNA to Thrive in the Digital Age. United States: Greenleaf Book Group Press, 2017. 		

4. Natarajan, P., Rogers, B., Dixon, E., Christensen, J., Borne, K., Wilkinson, L., & Mohan, S. Demystifying AI for the Enterprise: A Playbook for Business Value and Digital Transformation. Productivity Press.2021.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	2	-	-	2	2	2	2	2	3	3
CO2	3	3	3	3	2	2	1	2	2	1	1	3	2	3	3
CO3	2	3	3	3	3	1	3	2	3	3	3	3	3	3	3
CO4	1	2	2	2	3	2	3	3	3	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	2	3	3	3	3	3	3
Avg	2.4	2.75	2.4	2.75	2.75	2	2.25	2.25	2.4	2.2	2.2	2.6	2.6	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 593	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	ENTREPRENEURSHIP AND FINTECH	<i>Major</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. To understand the fintech ecosystem and regulations in India. 2. To develop Entrepreneurial traits and Innovation in Fintech 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to:</p> <p>CO1. Understand the Fintech ecosystem and developments in FinTech</p> <p>CO2. Evaluate Macroeconomic and legal factors concerning Fintech</p> <p>CO3. Analyse the existing fintech products and identify opportunities and trends</p> <p>CO4. Apply suitable business strategies to fintech ventures</p> <p>CO5. Design a comprehensive fintech startup proposal</p>		
<p>Pedagogy: <i>Lecture, Case discussion, Idea Presentation, Brainstorming, Business Plan Assignment</i></p>		
<p>UNIT I: INTRODUCTION AND EVOLUTION OF FINTECH</p> <p>Fintech Revolution- economic, technological, and global factors involved in the fintech revolution- opportunities and changes- categories of FinTech, lending and personal finance-crowd-finding and business financing-payments and retail transactions- equity trading and investment applications-cryptocurrencies, and banking infrastructure and tools.</p>		6 Hrs
<p>UNIT II: ECONOMIC & REGULATORY FRAMEWORK OF FINTECH</p> <p>Geography of fintech adoption- Mobile payments and bank accounts - fintech credit - macroeconomics and the cost of finance- cost of financial intermediation- regulatory environment – RBI.</p>		9 Hrs
<p>UNIT III: THE FINTECH ECOSYSTEM</p> <p>Understanding of FinTech market applications and FinTech technologies- Current and future trends in FinTech world-wide. - Existing fintech products and Services- Identifying the Limitations of the Existing Products and Services- major trends in fintech and the opportunities - Benefit from fintech trends-Business Plan Development- Developing new idea based on existing products and services.</p>		10 Hrs
<p>UNIT IV: FINTECH IDEA, EXECUTION & STRATEGIES</p> <p>Apply the business model canvas (BMC) to fintech ideas- Create a plan to start a new fintech project or organization- Improve an existing fintech project -Funding opportunities- Compare strategies for raising capital- fintech investments- Develop strategies to attract investors- implementation of project- applying top factors and strategies- competition and risk</p>		10 Hrs
<p>UNIT V: FINTECH PROJECT</p> <p>Ideate, design, develop, and prototype of fintech projects</p>		10 Hrs
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Phadke, Sanjay. FinTech Future: The Digital DNA of Finance. India: SAGE Publications, Incorporated, 2020. 2. Disrupting Finance: FinTech and Strategy in the 21st Century. Germany: Springer International Publishing, 2018. 3. Swanson, Seth. FinTech for Beginners: For Beginners! Understanding and Utilizing the Power of Financial Technology. N.p.: CreateSpace Independent Publishing Platform, 2016. 4. Financial Technology (FinTech), Entrepreneurship, and Business Development: Proceedings of The International Conference on Business and Technology (ICBT 2021). Switzerland: Springer International Publishing, 2022. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	1	2	3	3	3	3	3	2	2	3	3
CO2	2	3	-	1	-	1	1	-	1	1	1	-	2	3	2
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	2	3
CO4	2	3	2	2	2	2	1	2	2	2	2	2	2	2	1
CO5	3	3	3	3	3	3	3	3	3	3	2	3	3	2	2
Avg	2.2	3	2.5	2	2	2.2	2	2.5	2.2	2.4	2	2.25	2.4	2.4	2.2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 594	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	PROJECT PLANNING AND FINANCING	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> To understand the resources, schedules, risks, and scope to produce a desired outcome of a project To learn the tools and techniques for effective planning, financing and management of projects 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Understand the concepts of project management and project scheduling		
CO2. Demonstrate the project planning and project evaluation		
CO3. Organize and manage the resources of projects and analyse the sources of finance		
CO4. Analyse, quantify and use risk mitigation methodologies for mitigate risks		
CO5. Understand the critical legal aspects required for the improvement of project finance.		
Pedagogy: Lectures, Seminars, Case studies and Assignment		
Unit I: Introduction to Project management		7 Hrs
Project management Process and role of Project Manager. Project life cycle - Statement of Work - Work Breakdown Structure - Project Scope- Estimation of Project cost - Basic Scheduling Concepts: Resource Levelling, Resource Allocation. Team work in Project Management: Formation of Effective teams.		
Unit II: Project Planning		10 Hrs
Project Planning - Pre-investment phase, Investment Phase and operational phase - Developing the project network using CPM/PERT - Crashing of Project Networks - Project feasibility studies - Components of project feasibility studies – Managing Project resources flow - Project Evaluation: Project auditing: Phases of project audit - Project closure reports		
Unit III: Project Finance		10 Hrs
Introduction - The Project Finance Markets - Role of Advisors in Project Finance - Valuing the Project and Project Cash Flow Analysis - Sources of Finance.		
Unit IV: Assessing Risks in Project Finance		10 Hrs
Project Finance and Commercial Risks - Macroeconomic Risks -regulatory and political risks - risk mitigation methodologies for projects. Measures and perspectives on risk, sensitivity analysis, scenario analysis, breakeven analysis, Hiller model, simulation analysis, and decision tree analysis.		
Unit V: Legal Aspects in Project Finance		8 Hrs
Legal Aspects in Project Finance - Project Agreements - Sub-Contracts and Other Related Agreements - Project Finance Loan Documentation - Contemporary Issues in Project Finance		
Text Books:		
<ol style="list-style-type: none"> Prasanna Chandra, Projects-Planning Analysis, Selection, Financing, Implementation and Review, 6th edition, 2006. John M Nicholas & Herman Steyn “Project Management For Business And Technology”, Elsevier. Samnel.J.Montel, Jack.R.Meredith an Scott.M.Shafer Margaret .M.sutton with M.R.Gopalan”, Project Management,1st edition, Wiley India, 2006. PaneerSelvam, R., and Senthilkumar, P., Project Management, PHI, 2011. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO2	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO3	3	3	3	3	3	3	3	2	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
Avg	3	3	3	2.6	2.6	3	2.6	2.4	2.4	3	1.6	1.6	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 595	Subject Title	L T P C 2-0-2-3
<i>Technical</i>	APPLIED FINANCIAL ANALYTICS	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> 1. To nurture the analytical skills to find appropriate solutions to the business problems 2. To impart advanced econometric modelling to encourage research attitudes 		
Course Outcomes		
CO1. Understand the concepts and advanced econometric models		
CO2. Demonstrate the econometric models in empirical dimension		
CO3. Apply econometric modelling to solve business problems empirically		
CO4. Analyse and interpret the results obtained by applying econometric models		
CO5. Draw the inferences for financial decision making		
Pedagogy: <i>Lecture, Problem Solving, and Discussion of Research Papers.</i>		
Unit I Introduction to Data and Econometrics		5 Hrs
Steps in Empirical Economic Analysis –Structure of Economic Data – Causality and the Notion of Ceteris Paribus in Econometric Analysis.		
Unit II Time series Modelling		10 Hrs
Regression Analysis with Time series data - Nature of Time series data – Examples of Time series Regression Model – Finite Sample Properties of OLS under Classical assumptions – Functional Form, Dummy Variables, and Index Numbers – Trend and Seasonality -Using OLS with Time series data – Serial Correlation and Heteroskedasticity in Time series Regression.		
Unit III Advanced Time series Modelling		12 Hrs
Infinite Distributed Lag Models – Testing for Unit Roots – Spurious Regression – Co-integration and Error Correction Models – Value at Risk (VAR) – Granger Causality test - Non-Stationary Time series modelling: ARIMA Models – Autocorrelation functions – Partial Autocorrelation functions.		
Unit IV Volatility Forecasting Models		10 Hrs
Motivations- Historical Volatility – Implied Volatility – ARCH Models – GARCH – EGARCH- MGARCH Models.		
Unit V Panel Data methods		8 Hrs
Introduction – Pooling Independent Cross Sections across Time – Policy analysis with pooled Cross Sections – Two Period Panel Data Analysis – Policy analysis with Two period Panel Data – Differencing with more than Two Time Periods – Advanced Panel Data Methods: Fixed Effects Estimation – Random Effects Models.		
Text Books:		
<ol style="list-style-type: none"> 1. Wooldridge, Jeffrey M.. Introductory Econometrics: A Modern Approach. Brazil: Cengage Learning, 2020. 2. Gujarati, Damodar N.. Basic Econometrics. India: McGraw Hill, 2003. 3. Brooks, Chris. Introductory Econometrics for Finance. United Kingdom: Cambridge University Press, 2008. 4. Hair, Joseph F., Black, William C., Babin, Barry J., Anderson, Rolph E.. Multivariate Data Analysis. United Kingdom: Pearson, 2013. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3		3	3	1	1	1	2	1		1	3	3	2
CO2	1	3		3	3	1	1	1	2	1		1	3	3	2
CO3	2	3		3	3	2	2	2	2	2		2	3	3	2
CO4	2	3		3	3	2	2	2	2	2		2	3	3	2
CO5	2	3		3	3	2	2	2	2	2		2	3	3	2
Avg	1.6	3		3	3	1.6	1.6	1.6	2	1.6		1.6	3	3	2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code	Subject Title	L T P C
BTCB 596		3 0 0 3
<i>Cognitive</i>	INTRNATIONAL FINANCE AND FOREX TRADE	<i>Major</i>
Course Objectives:		
1. To provide a comprehensive understanding of global financial markets, including the roles of central banks, capital markets, and foreign exchange systems, and their impact on global economic stability 2. To equip students with the knowledge to analyse and manage risks in global financial environments using various financial instruments and strategies		
Course Outcomes:		
On completion of the course, the students will able to:		
CO1. Understand the structure and functioning of global financial markets, including the Euro currency system, international capital markets, and foreign exchange systems		
CO2. Apply financial instruments, such as derivatives, options, and swaps, to hedge risks and manage financial portfolios in global markets.		
CO3. Analyse the role of central banks in regulating financial markets and managing economic crises, such as the Global Financial Crisis (GFC) and Latin American debt crisis		
CO4. Evaluate the impact of global regulatory frameworks, including the Dodd-Frank Act, IMF regulations, and Basel III, on financial market stability and sovereign risk		
CO5. Create risk management strategies using financial market data and regulatory guidelines to address currency volatility and interest rate fluctuations in global markets		
Pedagogy: Lecture, Discussion, Case studies.		
Unit I:		9 Hrs
Euro Currency system – Initial years 1958-69 – Mature Years 1970 – 74 – Decline and Fall of Breton Woods System – Role of Central Banks – Monetary controls – Problems of Intermediation. Euro Debt Markets – Euro currency Markets – Evolution of Euro and Markets – Types – Volumes – operations across countries.		
Unit II:		9 Hrs
International Capital Markets -The role of capital markets in the economy -Bond markets -Equity markets -Derivatives markets -Efficient markets versus behavioural finance -Valuation of securities-Portfolio Strategies. Foreign Exchange Markets -Currency Risks and Hedging Strategies –Macro-economic context -Understanding FX quotes -Spot rates / Forward rates-(Triangular) Arbitrage –Inter-bank Market- Hedging & Speculation.		
Unit III:		9 Hrs
Central Banks – US Federal – European Central Banks – Central Bank of Japan – Bank of England – Peoples bank of China – Central bank of Russia – Brazil – Saudi Arabia Monetary Agency. Financial Crisis - Latin American and African Debt crisis 1982 – Asian Financial and Economic crisis 1963 – The Argentina crisis of 2001 – GFC 2008 – International Response to GFC.		
Unit IV:		9 Hrs
Monetary Economics and Banking -The History of Money -The role of central banks and their tool kit - Money Creation and Credit -Money supply, Inflation, deflation -Banking regulation (Basel III etc..) - Alternatives like Bitcoin . International Financial Reporting & Stakeholder Management - International Financial Reporting Standards (IFRS) -US Generally Accepted Accounting Principles (USGAAP) -Accounting & Ethics -Stakeholder Management & Sustainability.		
Unit V:		9 Hrs
Euro currency Derivatives – Currency Forward and Futures Markets– Currency Options–Option Combinations–Put –Call parity–Hedging–Trading on Volatility–Currency and Interest Rate Swaps–Swap valuation–Globally Traded Commodities–Commodity price Indicators–Futures price and cost of carry– Backwardation . Regulatory Frameworks - the Brady plan of 1989 to 1994 – Post GFC – International		

Financial Regulators – Dodd Frame Act of USA – Global Measures – IMF Regulations – Bank Levis& Financial Taxes – A sovereign Bankruptcy Regime.

Text Books:

1. Ross P. Buckley, Douglas Arner, “From Crisis to Crisis, The global Financial System and Regulatory Failure”, Kluwer Law International, ISBN 9789041133540, 2011.
2. Antonio G. Fazio, Luigi De Rosa, “International Banking and Financial Systems: Evolution and Stability”, 2003.
3. Lessambo, Felix I, “The International Banking System Capital Adequacy, Core Businesses and Risk Management”, 2012, Palgrave Macmillan UK
4. George W. McKenzie, “The Economics of the Euro-Currency System”, Macmillan Publishers Limited 1976
5. Daniel Gros, Karel Lannoo, “The Euro Capital Market”, ISBN: 978-0-471-99762-7, Wiley

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO2	3	3	3	2	2	3	2	2	2	3	1	1	2	2	2
CO3	3	3	3	3	3	3	3	2	2	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
Avg	3	3	3	2.6	2.6	3	2.6	2.4	2.4	3	1.6	1.6	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 597	Subject Title	L T P C 2 0 2 4
<i>Technical</i>	BUSINESS INTELLIGENCE	<i>Major</i>
Course Objectives:		
<ol style="list-style-type: none"> 1. To comprehend the process of acquiring Business Intelligence 2. To make the student to understand the knowledge discovering process for business decision making. 		
Course Outcomes:		
<p>On completion of the course the students will be able to:</p> <p>CO1. Recognize the clear knowledge about Data and information in Business intelligence.</p> <p>CO2. Discuss the knowledge discovery processes for decision making</p> <p>CO3. Implement the various classification and prediction techniques.</p> <p>CO4. Use the cluster analysis technique in decision making based on the different use cases.</p> <p>CO5. Examine the advance decision support technologies available.</p>		
Pedagogy: Lecture, Discussion, Case studies.		
Unit I: Business Intelligence		9 Hrs
<p>Effective and timely decisions – Data, information and knowledge — Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects –Data Warehousing and Business Analysis: - Components –Building a Data warehouse – DBMS Schemas, ETL– Metadata – reporting – Query tools and Applications – OLAP -- Interface of BI with organization capability</p>		
Unit II: Knowledge Discovery		9 Hrs
<p>Data Mining: - Data Mining Functionalities – Data Pre-processing – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining – Association Mining to Correlation Analysis – Constraint-Based Association Mining. Data Mining tools, Market Basket Analysis, Management Applications CRM, Data Visualization and Multidimensionality GIS and Business applications.</p>		
Unit III: Classification and Prediction		9 Hrs
<p>Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.</p>		
Unit IV: Cluster Analysis		9 Hrs
<p>Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis - Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Multimedia Data Mining – Text Mining – Mining the World Wide Web.</p>		
Unit V: Other Decision Supporting Technologies		9 Hrs
<p>Executive Support Systems, Knowledge Management Characteristics and Capabilities of DSS Collaborative Computing Technologies: Group Support Systems Intelligent Support Systems (Expert Systems, ANN, Genetic Algorithm etc.) and their Managerial Applications.</p>		
Text and Reference Books:		
<ol style="list-style-type: none"> 1. Jiawei Han and MichelineKamber, Data Mining Concepts and Techniques, Third Edition, Elsevier, Reprinted 2012. 		

2. Alex Berson and Stephen J. Smith, **Data Warehousing, Data Mining & OLAP**, Tata McGraw – Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, ShyamDiwakar and V. Ajay, **Insight into Data mining Theory and Practice**, Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta, **Introduction to Data Mining with Case Studies**, Easter Economy Edition, Prentice Hall of India, 2006.

LIST OF INDICATIVE EXPERIMENTS

S.No.	List of Indicative Experiments	Hours
1	Defining Business Requirements: Dimensional Analysis, Developing Information Packages, Requirements Definition	6 hours
2	Architecture and Infrastructure Specification: Metadata definition, Multi-Dimensional Modelling: Star Schema and Snow Flake Schema	6 hours
3	Extraction, Transformation and Loading: Defining rules for ETL, Usage of ETL Tools	6 hours
4	Information Delivery– OLAP, ROLAP and MOLAP	6 hours
5	Data Mining–Usage of Data Mining Tools	6 hours
Total Laboratory Hours		30 hours

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	-	-	-	-	-	1	2	2	2	2
CO2	2	3	2	3	3	-	-	-	-	-	3	2	3	3	2
CO3	2	3	2	3	3	-	-	-	-	-	3	2	3	3	3
CO4	2	3	2	3	3	-	-	-	-	-	3	2	2	3	3
CO5	2	3	2	3	3	-	-	-	-	-	3	2	3	2	3
Avg	2	2.6	2	2.6	2.6	-	-	-	-	-	2.6	2	2.6	2.6	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

SEMESTER X

COURSE CODE	COURSE TITLE	L-T-P-C
BTCB 598	Critical Thinking and Problem Identification / Research Methodology	3-1-0-4
BTCB 599	Internship / Research Project	0-0-36-18
Total Credits		22

Subject Code BTCB 598	Subject Title	L T P C 3-1-0-4
<i>Cognitive & Technical</i>	CRITICAL THINKING AND PROBLEM IDENTIFICATION	<i>Major</i>
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To develop students' ability to think critically and analytically, enabling them to identify, define, and approach complex problems with well-reasoned solutions. To equip students with practical problem-solving skills and personal management techniques, fostering their capability to implement solutions effectively in real-world business environments. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <p>CO1. Define the key concepts of critical thinking, problem identification, and reasoning, and recognize their importance in business decision-making</p> <p>CO2. Explain the relationship between critical thinking, creative thinking, and strategic thinking, and how they contribute to problem-solving in various business contexts</p> <p>CO3. Apply problem-solving techniques to identify, analyse, and develop solutions for business problems, using structured methods such as SQ4R and reasoning frameworks</p> <p>CO4. Analyse the underlying causes of problems and evaluate potential solutions, taking into account risk factors, reasoning, and contextual influences on decision-making</p> <p>CO5. Evaluate the effectiveness of implemented solutions by assessing their feasibility, logic, and impact on business processes, making adjustments as needed for improvement</p>		
<p>Pedagogy: Lectures, Practical, Seminars, Assignments, Quiz, Project, Case Study</p>		
<p>Unit I: Critical Thinking</p> <p>Meaning of Thinking – Need for Thinking – Correlation between Intellect with the Thinking Activities – Levels of Thinking – Critical Thinking – Ways of Improving Critical Thinking – Context and Thinking Maps & Evaluating Inferences – Critical Thinking vs Creative Thinking – Critical Thinking vs Strategic Thinking - Role of Analytical Thinking in Critical Thinking – Implementation of SQ4R Approach (Survey, Question, Read, Recite, Review, and wRite)</p>		<p>9 Hrs</p>
<p>Unit II: Problem Solving Skills</p> <p>Problem Identification and Definition – Ways of Identifying Problems – Analysing the potential causes – Identifying and Selecting the best solutions – Developing an Action plan – Implementing Solutions – Evaluating the Progress - Developing Problem solving Skills</p>		<p>9 Hrs</p>
<p>Unit III: Personal Skills</p> <p>Soft skills required for Critical Thinking – Self- Management – Time Management – Grooming for various occasions – Learning from own action – Assertiveness – Team Management – Playing the role of team members – Recognising the needs of others – Predicting the Risk – Risk mitigation steps – Innovative ideas – Group Discussion -</p>		<p>8 Hrs</p>
<p>Unit IV: Application of Reasoning and other Skills</p> <p>Introduction to reasoning – Premises in reasoning – Data and source of data as the strengths of the reasoning – Analysing and Evaluating Reasoning - Role of Analytical thinking in critical thinking – How to do the analytical thinking – Exercises for developing reasoning skills – Constructing Reasoning.</p>		<p>9 Hrs</p>
<p>Unit V: Design and Implementation of Solutions (Problem Solving)</p> <p>Evaluating a solution - Considering the history of problem, logic/reasoning behind the solution, the feasibility of the solution, and the impacts of the solution -Implementing a solution in a manner that addresses thoroughly and deeply multiple contextual factors of the problem.</p>		<p>10 Hrs</p>

Text Books:

1. Paul, R. W., & Elder, L. (2002). **Critical Thinking: Tools For Taking Charge Of Your Professional and Personal Life.** USA: Prentice Hall.
2. Fisher, A. E. **Critical Thinking: An Introduction.** Cambridge: CUP
3. Thomson, A. **Critical Reasoning: A Practical Introduction.** New York: Routledge.
4. Krulik S and J.Rudnick, "Problem solving A Hand Book for Teachers, Creative Publications

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

*S-Strong (3)**M-Medium (2)**L-Low (1)*

Subject Code BTCB 599	Subject Title	L T P C 0 0 36 18
<i>Technical</i>	RESEARCH PROJECT	Major
<p>The Final Research/Internship Project has two Phases.</p> <p>Phase I:</p> <p>In case of Research Project, students under the guidance of Faculty in-charge(s) of the given project work, carry out the background work, identify a tentative Title for the Project work, Review 20-25 Research papers, prepare a Review Paper.</p> <p>In case of Industry Project, students under the guidance of Faculty in-charge(s) and Industry Guide of the undertaken project work, carry out the background work, identify a tentative Title for the Project work, review technical documents, prepare a Proposal Paper.</p> <p>A public presentation on broad areas of proposed work to be made by students before starting II phase. Presentations would be evaluated by the Committee of Internal Faculty</p> <p>Phase II:</p> <p>Midterm and Final review to be evaluated by the Committee of Internal Faculty based on the work carried out by the students by presenting their work. The division of Marks for Phase I and Phase II components are 40% and 60% respectively.</p> <ul style="list-style-type: none"> ● Final Project Work must be in the inter-disciplinary area of Banking/Finance and IT. ● Students should be in regular contact with their faculty guide(s) 		

Subject Code BTCB 599	Subject Title	L T P C 0 0 36 18
<i>Technical</i>	INTERNSHIP	Major

Students should submit a draft of the Industry Project Report by the First week of April.

Final Project Report must contain the following Components: (75-100 Pages)

1. Title Page (Soft Binding)
2. 4- 5 Chapters (Back ground work, Methodology/Algorithm/Mathematical Model)
3. The final project report should be prepared by following the template provided by the department.

HONOR COURSES

S.No.	COURSE CODE	COURSE TITLE	L-T-P-C
1.	BTCB 611	System Software	3-1-0-4
2.	BTCB 612	Computer Graphics	3-1-0-4
3.	BTCB 613	Digital Image Processing	3-1-0-4
4.	BTCB 614	Rural Banking & Micro-Finance	3-1-0-4
5.	BTCB 615	Legal Aspects of Banking and Finance	3-1-0-4
Total Credits			20

Subject Code BTCB 611	Subject Title	L T P C 3 1 0 4
<i>Technical</i>	SYSTEM SOFTWARE	<i>Honor Course</i>
Course Objectives:		
<ol style="list-style-type: none"> To understand the design principles of assemblers, linkers and loaders. To explore system software tools 		
Course Outcome:		
<p>On completion of the course, the students will be able to</p> <p>CO1. To understand the system software concepts and its architectures.</p> <p>CO2. To understand the functions of assemblers and its features.</p> <p>CO3. To understand the design and implementation of linkers and loaders.</p> <p>CO4. To understand the concepts of microprocessors.</p> <p>CO5. To understand the system software tools.</p>		
Pedagogy: <i>Lecture, Assignment, presentations</i>		
Unit I: Introduction		12 Hrs
System software and Machine Architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and Instruction formats - Addressing modes - Instruction sets - I/O and Programming.		
Unit II: ASSEMBLERS		12 Hrs
Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.		
Unit III: LOADERS AND LINKERS		12 Hrs
Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking. Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.		
Unit IV: MACRO PROCESSOR		12 Hrs
Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro- Implementation example - MASM Macro Processor – ANSI C Macro language.		
Unit V: SYSTEM SOFTWARE TOOLS		12 Hrs
Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.		
Text and Reference Books:		
<ol style="list-style-type: none"> Leland L. Beck, “System Software – An Introduction to Systems Programming”, Pearson Education Asia, 3rd Edition, 2000. D. M. Dhamdhere, “Systems Programming and Operating Systems”, Tata McGraw-Hill, 2nd Edition, 1999. John J. Donovan “Systems Programming”, Tata McGraw-Hill Edition, 1972. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3
	<i>S-Strong (3)</i>			<i>M-Medium (2)</i>				<i>L-Low (1)</i>							

Subject Code BTCB 612	Subject Title	L T P C 3 1 0 4
<i>Technical</i>	COMPUTER GRAPHICS	<i>Honor Course</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To learn basic graphic functions to represent 2D,3D geometric transformations using OpenGL library functions. To explore the colour representation and light models in graphics. 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. To understand the basic graphic functions and graphic output primitives.</p> <p>CO2. To understand 2D geometric transformations and viewing functions</p> <p>CO3. To understand 3D geometric transformations and viewing functions</p> <p>CO4. To explore OpenGL library functions.</p> <p>CO5. To understand colour representations, lighting models.</p>		
<p>Pedagogy: <i>Lecture, Assignment, presentations</i></p>		
<p>Unit I: GRAPHIC OUTPUT PRIMITIVES 12 Hrs</p> <p>Absolute and Relative coordinate Specifications Point Function, Line Function, Line Drawing Algorithms, DDA, Bresenham’s Line drawing algorithms- curve functions, Circle-Generating Algorithms- Midpoint Circle Algorithms, Ellipse Generating Algorithms, Midpoint Ellipse Algorithm- Polygon fill Area functions, Vertex Array, Pixel Array, bitmap, pixmap, Character Function.</p>		
<p>Unit II: TWO DIMENSIONAL GEOMETRIC TRANSFORMATIONS 12 Hrs</p> <p>Matrix Representations and Homogeneous Coordinates, Composite Transformations; 2D Viewing – Viewing Pipeline, Viewing coordinate, Reference frame; Window- to- Viewport coordinate Transformation, Two Dimensional Viewing Functions; Clipping Operations – Point, line, and Polygon Clipping Algorithms.</p>		
<p>Unit III: THREE-DIMENSIONAL GRAPHICS 12 Hrs</p> <p>3D object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; 3D viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.</p>		
<p>Unit IV: OPENGL LIBRARIES 12 Hrs</p> <p>Graphics Programming Interfaces- Graphics pipeline- Shades – programming Shaders- data flow in the programmable pipeline, OpenGL and GLSL version, OpenGL Extensions, Functions of GLSL, Efficiency of different drawing methods.</p>		
<p>Unit V: COLOUR REPRESENTATION & LIGHTING MODELS 12 Hrs</p> <p>Greyscale representation and intensities, colour models and spaces, colour interpolation-Lightning Models- light sources of local illumination, reflection by Phong, shading, shadows, opacity and transparency- Texture process.</p>		
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> Donald Hearn, M.Pauline Baker, and Warren Carithers, “Computer Graphics with OpenGL”, Pearson Education, 4th Edition, 2013. Karsten Lehn , Merijam Gotzes , Frank Klawonn, “Introduction to Computer Graphics: Using OpenGL and Java”, Springer, 3rd Edition, 2023. 		

3. James D. Foley, "Computer Graphics: Principles and Practice", Pearson Education, 2nd Edition, 2021.
4. John F Hughes, Andries Van Dam, Morgan McGuire, David F Sklar, James D Foley, Steven K Feiner and Kurt Akeley, "Computer Graphics", 2018.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2							2	2	2	2
CO2	1	2	2	2	2							2	2	2	2
CO3	2	2	3	2	2							2	3	2	2
CO4	2	2	3	2	2							2	3	2	2
CO5	2	2	3	2	1							2	3	3	3
Avg	1.8	2	2.6	2	1.8							2	2.6	2.2	2.2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 613	Subject Title	L T P C 3 1 0 4
<i>Technical</i>	DIGITAL IMAGE PROCESSING	<i>Honor Course</i>
Course Objectives:		
<ol style="list-style-type: none"> To understand the concepts of Image Processing. To design applications using Image Processing. 		
Course Outcome:		
On completion of the course, the students will be able to		
CO1. To understand the fundamentals of image processing.		
CO2. To understand the image processing operations and transformations.		
CO3. To understand the image enhancement and restoration techniques.		
CO4. To understand various image compression techniques.		
CO5. To understand the aspects of image segmentation.		
Pedagogy: <i>Lecture, Assignment, presentations</i>		
Unit I: Introduction		12 Hrs
Nature of Image Processing and Its Applications – Image Representations – Image Types – Image Processing Operations – Image Acquisition – Image Sampling and Quantization – Image Quality – Image Storage and File Formats .		
Unit II: IMAGE PROCESSING OPERATIONS		12 Hrs
Need for Image Transforms – Fourier Transforms and Its Properties – Haar, slant, Hadamard Transforms and Its Applications.		
Unit III: IMAGE ENHANCEMENT AND RESTORATION		12 Hrs
Need for Enhancements – Point operations – Histogram Techniques – Spatial filtering concepts – Frequency Domain Filtering – Image Smoothing – Image Sharpening – Image degradation and Noise Models – Introduction to Restoration Techniques.		
Unit IV: IMAGE PROCESSING ACTIVITIES		12 Hrs
Image Compression: Compression Models and Measures – Coding Types – Types of Redundancy – Lossless Compression Algorithms – Lossy Compression Algorithms – Introduction to Compression Standards.		
Unit V: IMAGE SEGMENTATION		12 Hrs
Detection of Discontinuities – Edge Detection – Thresholding – Region Based Segmentation – Introduction to Color Image Processing – Introduction to Morphological Operations and Image Processing Framework.		
Text and Reference Books:		
<ol style="list-style-type: none"> S. Sridhar, “Digital Image Processing”, Oxford Press, 1st Edition, 2011 Anil Jain K, “Fundamentals of Digital Image Processing”, Prentice-Hall of India, 1989. Sid Ahmed, “Image Processing”, McGraw-Hill, 1995. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2							2	2	2	2
CO2	1	2	2	2	2							2	2	2	2
CO3	2	2	3	2	2							2	3	2	2
CO4	2	2	3	2	2							2	3	2	2
CO5	2	2	3	2	1							2	3	3	3
Avg	1.8	2	2.6	2	1.8							2	2.6	2.2	2.2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 614	Subject Title	L T P C 3 1 0 4
<i>Technical</i>	RURAL BANKING & MICRO-FINANCE	<i>Honor Course</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To introduce and expose the key issues in rural banking To introduce various Government initiatives for inclusive financial system 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. To gain knowledge on rural financing and development policy.</p> <p>CO2. To acquire practical knowledge on problems and prospects in rural banking.</p> <p>CO3. To understand the concepts of micro-finance.</p> <p>CO4. To explore the various microfinance models in India.</p> <p>CO5. To study the emerging aspects of technology in rural banking.</p>		
<p>Pedagogy: <i>Lecture, Assignment, presentations</i></p>		
<p>Unit I: Introduction</p> <p>Demographic features- Population- occupation- literacy, socio- economic development – indicators-health-nutrition and education, - urban migration- -Caste and power structure - rural social stratification- Economic life of rural people, share in National income- Trends in percapita income, rural money markets, rural indebtedness, rural poverty - main causes and methods of measuring rural poverty.</p>		12 Hrs
<p>Unit II: Agricultural Economy</p> <p>Agriculture Economy-Structure and characteristics of Indian agriculture- Role of agriculture in economic development-agriculture-industry linkages -constraints to agriculture development- Emerging issues in Indian Agriculture- Rural infrastructure; Transport, Power- Markets and other services</p>		12 Hrs
<p>Unit III: Rural Financing and Development Policy</p> <p>policies and programmes for rural farm and non-farm sectors. Economic reforms and its impact on rural economy- Regulation of Rural Financial Services; - NABARD, RBI- role, refinance support. Lead bank approach, State level and- District level Credit committees- subsidy-linked credit programmes of the Government- -Priority Sector Financing.</p>		12 Hrs
<p>Unit IV: Micro Finance</p> <p>Genesis and evolution of microfinance- different models of microfinance operating in India; - Bank Linkage Programme (SBLP) as an innovative strategy of microfinance evolved in India - SME Finance; Definition of SME .Importance to Indian economy- Financing of SME- Revival of sick units; revival package- and implementation, Stressed assets under rehabilitation.</p>		12 Hrs
<p>Unit V: Problems and prospects in Rural Banking</p> <p>Problems of Rural branches of Commercial banks- transaction costs and risk costs- Technology based Financial Inclusion- Emerging trends in rural banking-financing poor as bankable opportunity- Micro Credit, Self- Help Groups / NGOs, linkages with banking, latest guidelines of GOI and RBI.</p>		12 Hrs
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> Karmakar, K. G. Rural credit and self-help groups: micro-finance needs and concepts in India. Sage Publications India Pvt Ltd, 1999. Harper, Malcolm. Profit for the poor: cases in micro-finance. Intermediate Technology Publications Ltd (ITP), 1998. Robinson, Marguerite S. The microfinance revolution: sustainable finance for the poor. World Bank Publications, 2001. 		

4. De Aghion, Beatriz Armendariz, Beatriz Armendáriz, and Jonathan Morduch. The economics of microfinance. MIT press, 2007.
5. Sinha, Frances, Ajay Tankha, K. Raja Reddy, and Malcolm Harper. Microfinance self-help groups in India: living up to their promise? Practical Action Publishing, 2009.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	2	3	1	1	1	2	2	3	2	2
CO2	2	2	-	1	-	2	2	1	1	1	2	2	3	2	2
CO3	2	2	-	2	-	1	2	2	2	1	1	2	2	2	2
CO4	2	2	-	2	-	1	2	2	2	1	2	2	2	2	3
CO5	2	2	-	1	-	2	2	2	2	1	1	2	2	2	3
Avg	2.2	2	-	1.2	-	1.6	2.2	1.6	1.6	1	1.6	2	2.4	2	2.4

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 615	Subject Title	L T P C 3 1 0 4
<i>Technical</i>	LEGAL ASPECTS OF BANKING & FINANCE	<i>Honor Course</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To provide the students with practical legal knowledge of banking laws and other business law To provide knowledge on legal issues pertaining to business especially banking. 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. To understand the concepts of Business and Corporate Laws</p> <p>CO2. To acquire required knowledge and demonstrate skills sets required legal process</p> <p>CO3. To appreciate the concepts of Contract Act and other relevant Acts.</p> <p>CO4. To acquire practical knowledge and understanding of Financial Regulations.</p> <p>CO5. To study the various laws for Banking and Finance.</p>		
<p>Pedagogy: <i>Lecture, Assignment, presentations</i></p>		
<p>Unit I: Introduction</p> <p>Introduction to Law- Fundamentals of Law-The Indian Contract- Indemnity and guarantee- Termination of Contracts- Bailment- Agency.</p>		12 Hrs
<p>Unit II: Regulations and Compliance</p> <p>Provisions of RBI Act, 1934- Banking Regulation Act, 1949- Banking Companies (Acquisition and transfer of undertaking Act 1970 & 1980) - Government and RBI's Powers-Companies Act, 1956/2013.</p>		12 Hrs
<p>Unit III: Banking Operations</p> <p>The Negotiable Instruments Act,1881(Amendment and Miscellaneous Provisions) Act, 2002- Notes, Bills and Cheques-Promissory notes, Bills of exchange and cheques (Demand, drafts, payment orders etc.) - Responsibility of paying-collecting banker indemnities -guarantees - scope and application - obligation of a banker – Endorsement- Crossing of Cheques-Dishonors of Cheques</p>		12 Hrs
<p>Unit IV: Commercial Laws with reference to banking operations</p> <p>Letter of Credit, Indemnity, Guarantee and Bond precautions and rights-laws relating to bill finance, LC and Deferred payments - Law relating to securities - valuation of securities - modes of charging securities - lien, pledge, mortgage, hypothecation etc.</p>		12 Hrs
<p>Unit V: Other Laws</p> <p>The Partnership Act, 1932- Definition- types of partnership-relation of partners to one another - Minor admitted to the benefits of partnership -Dissolution of firm- effect of non-registration - The Transfer of Property Act -The Sale of Goods Act, 1930 (Sale and Agreement to sell)2000 - Right to information Act.</p>		12 Hrs
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> Pathak, Akhileshwar. Legal Aspects of Business. Tata McGraw-Hill Education, 2013. Legal and Regulatory Aspects of Banking. Indian Institute of Banking and Finance,Macmillan India Ltd (2010/Latest). Kumar, Ravinder: Legal Aspects of Business,Ceneage Learning India Pvt Ltd, 201/Latest. Pathak, Akhileshwar. Legal Aspects of Business. Tata McGraw-Hill Education, 2013. Satish B Mathur. Business Law. Tata McGraw - Hill Education,2013 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	-	-	-	-	-	-	2	2	2
CO2	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO3	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO4	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO5	2	2	2	2	2	2	-	-	-	-	-	-	2	2	2
Avg	2	2	2	2	2	2	-	-	-	-	-	-	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

MINOR COURSES

S.No.	SEMESTER	COURSE CODE	COURSE TITLE	L-T-P-C
1.	III	BTCB 616	Data Structures	3-1-0-4
2.	IV	BTCB 617	Principles of Database Systems	3-1-0-4
3.	V	BTCB 618	Network Technology	3-1-0-4
4.	VI	BTCB 619	Central Banking and Monetary Policy	3-1-0-4
5.	VII	BTCB 620	Digital Marketing and CRM	3-1-0-4
			Total Credits	20

Subject Code BTCB 616	Subject Title	L T P C 3 1 0 4
Technical	DATA STRUCTURES	Minor
Course Objectives:		
<ol style="list-style-type: none"> To familiarize with basic data structures and their use in fundamental algorithms To compare various data structures and analyse its applications. 		
Course Outcome:		
On completion of the course, the students will be able to		
CO1. To understand the different concepts of data structure.		
CO2. To apply data structure in searching and sorting techniques.		
CO3. To understand the advanced data structures.		
CO4. To understand the performance of the algorithms.		
CO5. To understand the suitability of techniques for the given problems.		
Pedagogy: Lecture, Assignment, presentations		
Unit I: Introduction		12 Hrs
Algorithmic Notation - Big Oh - Analyzing Algorithms. Arrays: One Dimensional, Multidimensional Array, Pointer Arrays. Linked List: Singly, Doubly and Circular Linked Lists.		
Unit II: SEARCHING AND SORTING		12 Hrs
Linear Search, Binary Search, and Fibonacci Search. Sorting: Insertion Sort, Selection Sort, Bubble Sort and Heap Sort. Radix Sort, Bucket Sort, Shell Sort.		
Unit III: STACKS, QUEUES AND LINKED DATA STRUCTURES		12 Hrs
Stacks: Definition – Operations - Applications of Stack. Queues: Definition - Operations – Priority Queues - De Queues – Applications of Queue. Linked Stacks, Linked Queues, Applications of Linked List – Dynamic Storage Management.		
Unit IV: TREES AND GRAPHS		12 Hrs
Binary Tree, Terminology, Representation, Traversals, Applications – Binary Search Tree –Graph: Terminology, Representation, Traversals – Applications - Spanning Trees, Shortest Path and Transitive Closure, Topological Sort.		
Unit V: DIVIDE AND CONQUER, GREEDY METHOD		12 Hrs
Divide and Conquer: General Method – Binary Search – Maximum and Minimum – Merge Sort – Quick Sort. Greedy Method: General Method – Knapsack Problem – Minimum Spanning Tree Algorithms – Single Source Shortest Path Algorithm.		
Text and Reference Books:		
<ol style="list-style-type: none"> D.Samanta, “Classic Data Structures”, MaakZoo Publisher, 2nd Edition, 2023. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures”, Galgotia Book Source, Pvt. Ltd., 2004. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Galgotia Publications Pvt. Ltd., 2008. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	2	2						2	2	2	2
CO2	2	2	3	2	2	2						2	2	2	3
CO3	2	2	3	3	2	2						3	3	2	2
CO4	3	3	3	3	2	3						3	3	3	3
CO5	3	3	3	2	3	3						3	3	3	3
Avg	2.4	2.6	2.8	2.4	2.2	2.4						2.6	2.6	2.4	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 617	Subject Title	L T P C 3 1 0 4
Technical	PRINCIPLES OF DATABASE SYSTEMS	Minor
Course Objectives:		
<ol style="list-style-type: none"> To learn the physical and logical database designs. To understand the concepts of database modeling, relational, hierarchical, and network models. 		
Course Outcome:		
On completion of the course, the students will be able to		
CO1. To understand the concepts and features of database systems and master in design principles		
CO2. To transform an information model into a relational database schema and effectively organize the data using normalization		
CO3. To formulate solutions to a broad range of query and data update problems using SQL		
CO4. To understand the basics of query processing, optimization and fast retrieval techniques with the familiarity of transaction processing		
CO5. To understand the issues in concurrency control and familiarizing in different database architectures		
Pedagogy: <i>Lecture, Assignment, presentations</i>		
Unit I: INTRODUCTION TO DATABASE CONCEPTS		12 Hrs
Database System: Definition, Purpose, Application, Data Abstraction, Database Architecture, Database Users, Database Administrators, Instances & Schema, Data Models. Entity Relationship Model: Overview, Definitions, ER Diagram, Mapping Cardinalities, Reduction to Relational Schema, Extended ER Features.		
Unit II: RELATIONAL MODEL AND DESIGN		12 Hrs
Relational Model- Structure of Relational Database, Keys (Primary, Foreign, Candidate, Super). Relational Algebra- Definition and Operations. Relational Database Design- Overview, Normalization, Normal Forms (First, Second, Third, Boyce Codd), Decomposition using Functional Dependencies and Multi-Valued Dependencies.		
Unit III: SQL		12 Hrs
SQL- Definition, Basic Structure, Datatypes, Basic Operations (DDL, DML, DCL), Set Operations, Aggregate Functions, Nested Sub-queries, Join Expression, Views, Transactions, Integrity Constraints, Authorization. PL-SQL- Definition, Basic Structure, Procedures, Functions, Cursors, Triggers, Packages.		
Unit IV: QUERY PROCESSING AND TRANSACTION		12 Hrs
Query Processing- Basic Steps, Measures of Query Cost, Query Optimization. Indexing-Definition, Purpose, Types of Indexing, B Tree and B+ Tree. Hashing- Basic Concepts, Hash Function, Static and Dynamic Hashing. Transaction - Overview, Transaction States, ACID properties, Implementation of ACID properties, Serializability.		
Unit V: CONCURRENCY CONTROL AND SYSTEM ARCHITECTURE		12 Hrs
Overview, Lock Types, Lock based Protocols, Deadlock Conditions and Handling, Recovery Systems- Introduction to Parallel Databases, Distributed Databases, Data Mining and Data Warehouse.		
Text and Reference Books:		
<ol style="list-style-type: none"> Elmasri and Navathe, “Fundamentals of Database Systems”, 7th Edition, Addison-Wesley, 2022. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, “Database System Concepts”, 7th Edition, McGraw Hill International Inc., 2019. Fred R McFadden, Jeffery A. Hoffer and Mary B. Prescott, “Modern Database Management”, Addison Wesley, 2018. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO2	3	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	3	3
CO4	2	2	3	3	2	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
Avg	2.6	2.2	2.4	2.4	2	-	-	-	-	-	-	-	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 618	Subject Title	L T P C 3 1 0 4
Technical	NETWORK TECHNOLOGY	Minor
Course Objectives:		
<ol style="list-style-type: none"> To learn the concepts of layered architecture of computer networks, ISO/OSI model, TCP/IP protocol suite and other network protocols. To understand the concepts of Network Security standards. . 		
Course Outcome:		
<p>On completion of the course, the students will be able to</p> <p>CO1. To identify the need for networking and understand the layered concept computer networks.</p> <p>CO2. To understand the basics concepts of data communication and physical medium.</p> <p>CO3. To understand about wired and wireless data link layer.</p> <p>CO4. To understand the devices needed for networking and discover the addressing techniques.</p> <p>CO5. To learn various standard protocols at different layers of the network.</p>		
Pedagogy: <i>Lecture, Assignment, presentations</i>		
Unit I: NETWORKING FUNDAMENTALS		12 Hrs
Need for networking – Types of Network – Internetworking – Network models – Layered architecture – OSI Protocol Stack – TCP/IP Protocol Suite – Addressing – Physical vs Logical – Port Addressing. .		
Unit II: DATA COMMUNICATION AND PHYSICAL MEDIUM		12 Hrs
Analog Vs Digital data – Transmission impairment – Data rate limits and performance – Transmission media – Guided Vs Unguided media – Characteristics – Virtual Circuit networks – Structure of a Switch.		
Unit III: DATA LINK LAYER: WIRED AND WIRELESS		12 Hrs
Error detection and correction – Block coding - CRC - Flow and error control –Stop and Wait protocol – Go Back N ARQ protocol – Multiple Access – ALOHA – CSMA – CSMA/CD – CSMA/CA – FDMA – TDMA – CDMA –Ethernet Standard, Fast and Gigabit– IEEE standards - WLAN – IEEE 802.11 – Bluetooth..		
Unit IV: NETWORK AND TRANSPORT LAYER PROTOCOLS		12 Hrs
Connecting Devices- Hubs – Repeaters – Bridges – Routers – 2/3 Layer Switches – Gateway –Network Layers- Logical Addressing – IPv4 Vs IPv6 – Internet Protocol- ARP – ICMP – IGMP – Unicast Vs Multicast – Transport Layer: UDP - TCP.		
Unit V: APPLICATION LAYER AND NETWORK SECURITY		12 Hrs
Domain Name System – DNS records – Telnet – Email – FTP – WWW - Client Server – HTTP – SNMP – Network Security Services - IPsec – SSL – HTTPS – Firewalls – PGP.		
Text and Reference Books:		
<ol style="list-style-type: none"> Behrouz A. Forouzan, “Data Communications and Networking with TCP/IP protocol”, McGraw Hill, 6th Edition, 2021. Jochen Schiller, “Mobile Communications”, Pearson Education, 2nd Edition, 2020. James F. Kurose, Keith W. Ross, “Computer Networks–Top-down Approach”, Pearson Education, 3rd Edition, 2013. Andres S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall, 6th Edition, 2020. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	3					2		2	3	2	2
CO2	1	1	2	2	3							2	2		2
CO3	2	2	2	2	2					3		1	2	2	
CO4	1	2	1	1	3					2		2	2	3	3
CO5	2	2	2	2	2					1		2	2		1
Avg	1.6	1.8	1.6	1.8	2.6					1.8		1.8	2.2	1.4	1.8

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 619	Subject Title	L T P C 3 1 0 4
<i>Cognitive</i>	CENTRAL BANKING AND MONETARY POLICY	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To introduce the concepts on central banking and monetary policy. To introduce various functioning of the monetary Policy 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. To gain knowledge in central banking and its importance in floating economy</p> <p>CO2. To acquire knowledge of central banking operations</p> <p>CO3. To understand the theories of monetary policy.</p> <p>CO4. To learn the various monetary policy tools.</p> <p>CO5. To appraise the various role of Central Banks in the Economy.</p>		
<p>Pedagogy: <i>Lecture, Assignment, presentations</i></p>		
<p>Unit I: Introduction</p> <p>Understanding money- Concept-functions of money-kinds money of measurement-theories of money supply determination-savings- investments-role of debit card-credit card-plastic money-electronic money</p>		12 Hrs
<p>Unit II: Central Banking System</p> <p>RBI as Central Bank- structure-functions- working-reforms-current regulatory structure- reserve system-balance sheet; goals, targets, indicators</p>		12 Hrs
<p>Unit III: Monetary Theory</p> <p>Reserve system-money creation-money multiplier- money supply- The Level of Prices and the Value of Money- money supply- money demand, and monetary equilibrium-Quantity theory-inflation- classical theory of money-modern theory of money and income</p>		12 Hrs
<p>Unit IV: Central Banking and Monetary Policy</p> <p>Functions-goals-targets-indicators and instruments of monetary control-monetary management in an open economy-Tools of monetary policy- conduct of monetary policy- effect of monetary injection-current monetary policy of India.</p>		12 Hrs
<p>Unit V: Economics of Banking</p> <p>Understanding Interest Rates- Risk and Term Structure of Interest Rates- Interdependence of Markets and Interest Rates- Rational Expectations and Efficient Markets- Role of financial markets and institutions-problem of asymmetric information – adverse selection and moral hazard-financial crises.</p>		12 Hrs
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> Gans, Joshua, Robin Stone cash, Martin Byford, Gregory Mankiw, Stephen King, and Jan Libich. Principles of economics. Cengage AU, 2017. F. S. Mishkin and S. G. Eakins, Financial Markets and Institutions, Pearson Education, 8th Edition, 2014. M. Y. Khan, Indian Financial System, Tata McGraw Hill, Latest edition. Mishkin, Frederic S., ed. Monetary policy strategy. Mit press, 2007. Blinder, Alan S. Central banking in theory and practice. Mit press, 1999 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		2	2	1	1	1	1	1	2	2	3	2	2
CO2	3	3		2	2	1	1	1	1	1	2	2	3	2	2
CO3	3	3		3	3	2	2	2	2	2	3	3	3	3	3
CO4	3	3		3	3	2	2	2	2	2	3	3	3	3	3
CO5	3	3		3	3	2	2	2	2	2	3	3	3	3	3
Avg	3	3		2.6	2.6	1.6	1.6	1.6	1.6	1.6	2.6	2.6	3	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 620	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	DIGITAL MARKETING AND CRM	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To create a learning experience to enable the students To prepare the students for skillful marketing 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. Understand and appreciate the marketing skills</p> <p>CO2. Help the students to become successful marketing managers.</p> <p>CO3. Develop marketing skills and strategies.</p> <p>CO4. Learn the importance and need for CRM in Marketing.</p> <p>CO5. Explore the e-CRM strategies.</p>		
<p>Pedagogy: <i>Lecture, Assignment, presentations</i></p>		
<p>Unit I: Introduction</p> <p>Digital Marketing Foundation: Introduction to marketing- Concepts- Theories- Difference between traditional, inbound, and outbound marketing methodologies - Digital vs. Real Marketing -Digital Marketing Channels- Creating initial digital marketing plan.</p>		12 Hrs
<p>Unit II: Digital Marketing</p> <p>Resource planning - cost estimating - cost budgeting - cost control- E-mail marketing -E-mail marketing campaign analysis - Mobile Marketing – Content Marketing – App store Optimization – Affiliate Marketing – Adwords – Online display .</p>		12 Hrs
<p>Unit III: Social Media Marketing</p> <p>Understanding Social Media – Marketing Tools- Internet marketing – Face book- linkedin – Twitter advertising and publishing - Blogging- Freelancing-Video Marketing- Platform Specific Tools –Strategies- Social Media Marketing architecture.</p>		12 Hrs
<p>Unit IV: Competitor and Website Analysis</p> <p>Competitor Research Tools- Website Analysis Tools- Web analytics • Levels – Keyword Research Tools- Back Analysis Tools- Search Engine Optimization (SEO) – Tools - On Page and Off page SEO – Google analytics.</p>		12 Hrs
<p>Unit V: CRM</p> <p>CRM platform -CRM models – Exercise- CRM strategy- Customer Development Process- customer Retention-Customer satisfaction- Customer Retention Strategies- Relationship Management-CRM process for B2B markets -Technological Applications in CRM, -Customer Databases and Information Systems- Emerging Trend in CRM - e-CRM in Service Marketing, e-CRM strategies, e-CRM architecture</p>		12 Hrs
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> Fundamentals of Digital Marketing by Pearson– 2017 by Puneet Singh Bhatia Digital Marketing for Dummies 2020 by Ryan Deiss, Russ Henneberry Digital Marketing Paperback – Illustrated April 2015 by Vandana Ahuja Digital Marketing Second Edition 2020 by Seema Gupta Kingsnorth, Simon. Digital marketing strategy: an integrated approach to online marketing. Kogan Page Publishers, 2019. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	2	-	-	2	2	2	2	2	3	3
CO2	3	3	3	3	2	2	1	2	2	1	1	3	2	3	3
CO3	2	3	3	3	3	1	3	2	3	3	3	3	3	3	3
CO4	1	2	2	2	3	2	3	3	3	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	2	3	3	3	3	3	3
Avg	2.4	2.75	2.4	2.75	2.75	2	2.25	2.25	2.4	2.2	2.2	2.6	2.6	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No	Course Code	Course Title	Periods			Credits
			Lecture	Tutorial	Practical	
1.	BTCB701	Human Computer Interaction	3	0	0	3
2.	BTCB702	Machine Learning	3	0	0	3
3.	BTCB703	Open Source Software	3	0	0	3
4.	BTCB704	UI and UX Design	3	0	0	3
5.	BTCB705	Augmented Reality/ Virtual Reality	3	0	0	3
6.	BTCB706	Graphics and Image Processing	3	0	0	3
7.	BTCB707	Mobile Application Development	3	0	0	3
8.	BTCB708	Wireless Sensor Networks	3	0	0	3
9.	BTCB709	Next Generation Networks	3	0	0	3
10.	BTCB710	Internet of Things	3	0	0	3
11.	BTCB711	Optimization Techniques	3	0	0	3
12.	BTCB712	Deep Learning	3	0	0	3
13.	BTCB713	Knowledge Engineering	3	0	0	3
14.	BTCB714	Natural Language Processing	3	0	0	3
15.	BTCB715	Artificial Neural Networks	3	0	0	3
16.	BTCB716	Multimedia and Animation	3	0	0	3
17.	BTCB717	Financial Modelling	3	0	0	3
18.	BTCB718	Forex and Currency Derivatives	3	0	0	3
19.	BTCB719	Retail Banking	3	0	0	3
20.	BTCB720	Central Banking & Policy Development	3	0	0	3
21.	BTCB721	Corporate Restructuring	3	0	0	3
22.	BTCB722	Merchant Banking and Financial Services	3	0	0	3
23.	BTCB723	Corporate Governance & Business Ethics	3	0	0	3
24.	BTCB724	Cyber Crimes and IT Laws	3	0	0	3
25.	BTCB725	Risk Management in Banks	3	0	0	3
26.	BTCB726	Prudential Management for Banker	3	0	0	3
27.	BTCB727	Sustainable Finance	3	0	0	3
28.	BTCB728	Startup Financing	3	0	0	3
29.	BTCB729	Insurance and Risk Management	3	0	0	3
30.	BTCB730	Decentralized Finance (DeFi)	3	0	0	3

Subject Code BTCB 701	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	HUMAN COMPUTER INTERACTION	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> 1. Understanding various components of Human Computer Interaction domain 2. To learn the process of building effective interaction. 		
Course Outcome:		
<p>On completion of the course, the students will be able to</p> <p>CO1. Understand the terminologies associated with HCI.</p> <p>CO2. Acquire skills in designing usable interfaces.</p> <p>CO3. Appraise personalization in the interaction process.</p> <p>CO4. Boost insights about the importance of accessible interfaces.</p> <p>CO5. Solve real world applications by building effective interaction model.</p>		
Pedagogy: <i>Lecture, Assignment, presentations</i>		
Unit I: Introduction		9 Hrs
Definition and scope of HCI - Historical Perspective - Theories and methods in HCI- Importance of HCI in software development.		
Unit II: HCI DESIGN PRINCIPLES AND FRAMEWORK		9 Hrs
Introduction to design principles- Models of Interaction- HCI frameworks- Basics of Ergonomics - Interaction styles- Interactivity- User experience- Fundamentals of Interaction design- User Interaction design principles.		
Unit III: USER-CENTERED DESIGN AND INTERACTION DESIGN		9 Hrs
Introduction to user-Centric design – Case studies, Historical evolution, Issues and challenges and current trend. Computational user models (classical) – GOMS, KLM, Fitts’ law, Hick-Hymans law - Computational user models (contemporary) – 2D and 3D pointing, Constrained navigation, Mobile typing, Touch interaction.		
Unit IV: USABILITY EVALUATION		9 Hrs
User centric design evaluation – Overview of evaluation techniques, Expert evaluation, User evaluation, Model-based evaluation with case studies-Accessibility in HCI.		
Unit V: FUTURE TRENDS IN HCI		9 Hrs
Emerging technologies- Artificial intelligence- AR/VR- Multimodal interaction- Interaction in Wearable devices- Accessibility and Inclusive design- Ethical consideration in HCI.		
Text and Reference Books:		
<ol style="list-style-type: none"> 1. Samit Bhattacharya, Human-Computer Interaction: User-Centric Computing for Design, 2019, 935316804X, McGraw-Hill. 2. Alan Dix, Janet E. Finlay, Gregory D. Abowd and Russel Beale. (2003). Human-Computer Interaction (3rd Edition), Pearson. 3. Ben Shneiderman, Catherine Plaisant, Maxine Cohen and Steven Jacobs. (2009). Designing the User Interfaces: Strategies for Effective Human-Computer Interaction, 5th Edition, Pearson. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 702	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	MACHINE LEARNING	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To introduce the basic concepts of machine learning and probability theory. To compare various machine learning techniques and practical aspects of probabilistic graphical models. 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. Understand the basic concepts of machine learning and probability theory.</p> <p>CO2. Infer the association and relationship between the data objects.</p> <p>CO3. Appraise various machine learning techniques.</p> <p>CO4. Boost the performance of the model by combining results from different approaches.</p> <p>CO5. Solve real world applications by selecting suitable learning model.</p>		
<p>Pedagogy: <i>Lecture, Assignment, presentations</i></p>		
<p>Unit I: Introduction 9 Hrs</p> <p>Machine Learning – Types of Machine Learning – Basic Concepts of Machine Learning - Machine Learning Process – Weight Space - Testing Machine Learning Algorithms - Turning Data into Probabilities – The Bias-Variance Trade off – Concept Learning and General-to-Specific Ordering.</p>		
<p>Unit II: Supervised Learning 9 Hrs</p> <p>Linear Discriminants – Perceptron – Linear Separability – Linear Regression - Multi Layer Perceptron – Going Forward – Going Backward - Support Vector Machine Algorithm - Decision Tree Learning – Random Forest Model.</p>		
<p>Unit III: Unsupervised Learning 9 Hrs</p> <p>K-means Algorithm –Hierarchical clustering - EM algorithm – Dimensionality Reduction Techniques - Vector Quantization – Self Organising Feature Map.</p>		
<p>Unit IV: Probabilistic Graphical Models 9 Hrs</p> <p>Bayesian Networks – Conditional Independence - Markov Random Fields – Naive Bayes Classifier - Hidden Markov Model – Tracking Methods.</p>		
<p>Unit V: Advanced Learning 9 Hrs</p> <p>Reinforcement Learning – The Learning Task – Q Learning – Temporal Difference Learning – Generalization – Relationship to Dynamic Programming - Ensemble Learning – Boosting – Bagging – Deep Learning.</p>		
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> Stephen Marsland, Machine Learning – An Algorithmic Perspective, Chapman & Hall/CRC Press, Second Edition, 2013. Tom M Mitchell, Machine Learning, McGraw Hill Education, First Edition, 2013. Ethem Alpaydin, Introduction to Machine Learning 3E (Adaptive Computation and Machine Learning Series), MIT Press, Third Edition, 2014. Miroslav Kubat, An Introduction to Machine Learning, Springer Publications, Second Edition, 2017. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	-	-	-	-	-	-	-	2	2	3
CO2	3	2	2	2	2	-	-	-	-	-	-	-	2	2	3
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	3	3
CO4	3	2	2	2	2	-	-	-	-	-	-	-	3	3	3
CO5	2	2	2	2	2	-	-	-	-	-	-	-	3	3	3
Avg	2.6	2	2	2	2	-	-	-	-	-	-	-	2.6	2.6	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 703	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	OPEN SOURCE SOFTWARE	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To be exposed to the context in operation of free and open source software (FOSS) communities, associated software projects. To learn scripting languages like Python, Perl and Ruby. 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. Install and run open-source operating systems.</p> <p>CO2. Understand information about Free and Open Source Software projects from software releases and from sites on the internet.</p> <p>CO3. Build and modify one or more Free and Open Source Software packages.</p> <p>CO4. Explore various programming techniques.</p> <p>CO5. Demonstrate the software to interact with Free and Open Source Software development projects.</p>		
<p>Pedagogy: <i>Lecture, Assignment, presentations</i></p>		
<p>Unit I: Introduction</p> <p>Notion of Community, Guidelines for effectively working with FOSS community, Benefits of Community based Software Development –Requirements for being open, free software, Open source software, Four degrees of freedom, FOSS Licensing Models, FOSS Licenses, GPL, AGPL, LGPL, FDL, Implications, FOSS examples .</p>		<p>9 Hrs</p>
<p>Unit II: LINUX</p> <p>Linux Installation and Hardware Configuration, Boot Process, Linux Loader (LILO), The Grand Unified Boot loader (GRUB), Dual-Booting Linux and other Operating System, Boot-Time Kernel Options, X Windows System Configuration, System Administration, Backup and Restore Procedures, Strategies for keeping a Secure Server.</p>		<p>9 Hrs</p>
<p>Unit III: FOSS PROGRAMMING PRACTICES</p> <p>GNU debugging tools, source code versioning and managing tools, Review of common programming practices and guidelines for GNU/Linux and FOSS, Documentation.</p>		<p>9 Hrs</p>
<p>Unit IV: PROGRAMMING TECHNIQUES</p> <p>Application programming, Basics of X Windows server architecture, QT programming, GTK + Programming, Python programming, Open source equivalent of existing Commercial software.</p>		<p>9 Hrs</p>
<p>Unit V: PROJECTS AND CASE STUDIES</p> <p>Linux for portable Devices, Creation of Bootable CD and USB from command line, Case Studies – Samba, Libre office, Assistive technology.</p>		<p>9 Hrs</p>
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a Nutshell”, OReilly Media, 6th Edition, 2009. Philosophy of GNU URL: http://www.gnu.org/philosophy/ Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/ linux-admin-made-easy/ The Python Tutorial available at http://docs.python.org/2/tutorial/ Perl Programming book at http://www.perl.org/books/beginning-perl/ . 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 704	Subject Title	L T P C 3 0 0 3
Cognitive	UI AND UX DESIGN	Minor
Course Objectives:		
<ol style="list-style-type: none"> To Learn the process of user experience designer research and analysis skills. To design an effective and compelling digital experiences across different platforms. 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Gain the basic knowledge of basic designing		
CO2. Understand the concepts of UI design.		
CO3. Study the concepts of UX design		
CO4. Implement Wireframe, prototype and testing		
CO5. Explore research methodologies on UI and UX design.		
Pedagogy: Lectures, Assignments, Case study		
Unit I: FOUNDATIONS OF DESIGN		9 Hrs
UI vs. UX Design - Core Stages of Design Thinking, Divergent and Convergent Thinking, Brainstorming and Game storming, Observational Empathy.		
Unit II: FOUNDATIONS OF UI DESIGN		9 Hrs
Visual and UI Principles - UI Elements and Patterns, Interaction Behaviors and Principles, Branding, Style Guides.		
Unit III: FOUNDATIONS OF UX DESIGN		9 Hrs
Introduction to User Experience - Why You Should Care about User Experience, Understanding User Experience, Defining the UX Design Process and its Methodology, Research in User Experience Design, Tools and Method used for Research, User Needs and its Goals, Know about Business Goals.		
Unit IV: WIREFRAMING, PROTOTYPING AND TESTING		9 Hrs
Sketching Principles - Sketching Red Routes, Responsive Design, Wireframing, Creating Wireflows, building a Prototype, Building High-Fidelity Mockups, Designing Efficiently with Tools, Interaction Patterns, Conducting Usability Tests, Other Evaluative User Research Methods, Synthesizing Test Findings, Prototype Iteration.		
Unit V: RESEARCH, DESIGNING, IDEATING & INFORMATION ARCHITECTURE		9 Hrs
Identifying and Writing Problem Statements, Identifying Appropriate Research Methods, Creating Personas, Solution Ideation, Creating User Stories, Creating Scenarios, Flow Diagrams, Flow Mapping, Information Architecture.		
Text Books:		
<ol style="list-style-type: none"> Joel Marsh, “UX for Beginners”, O’Reilly, Grey scale publishers, 2022. Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services”, O’Reilly, 2021. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” ,3rd Edition, O’Reilly, 2020. Steve Schoger, Adam Wathan, “Refactoring UI”, 2018. Steve Krug, “Don’t Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, 3rd Edition, 2015. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3	3	3
CO2		3							2	2			2	3	
CO3	3	3	3	2	3				2		2		3	3	
CO4		3	3	3	2					2	3	3		3	3
CO5	3	3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 705	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	AUGMENTED REALITY/ VIRTUAL REALITY	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To learn the basic principles of virtual reality applications, different gaming toolkits To develop AR/VR applications. 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Understand the basic concepts of AR and VR		
CO2. Recognize the tools and technologies related to AR/VR that are useful to solve real-world problems.		
CO3. Gain knowledge on VR programming		
CO4. Develop AR/VR applications in different domains		
CO5. Implement knowledge about AR/VR in real time applications.		
Pedagogy: Lectures, Assignments, Case study		
Unit I: INTRODUCTION		9 Hrs
Introduction to Virtual Reality and Augmented Reality – Definition, Introduction to Trajectories and Hybrid Space, Three I’s of Virtual Reality, Virtual Reality Vs 3D Computer Graphics, Benefits of Virtual Reality, Components of VR System, Introduction to AR- AR Technologies-Input Devices, 3D Position Trackers, Types of Trackers, Navigation and Manipulation Interfaces, Gesture Interfaces, Types of Gesture Input Devices, Output Devices, Graphics Display, Human Visual System, Personal Graphics Displays, Large Volume Displays, Sound Displays, Human Auditory System.		
Unit II: VR MODELING		9 Hrs
Modeling – Geometric Modeling, Virtual Object Shape, Object Visual Appearance, Kinematics Modeling – Transformation Matrices, Object Position, Transformation Invariants, Object Hierarchies, Viewing the 3D World, Physical Modeling, Collision Detection, Surface Deformation – Force Computation, Force Smoothing and Mapping, Behavior Modeling, Model Management.		
Unit III: VR PROGRAMMING		9 Hrs
VR Programming – Toolkits and Scene Graphs, World ToolKit, Java 3D, Comparison of World ToolKit and Java 3D		
Unit IV: APPLICATIONS		9 Hrs
Human Factors in VR – Methodology and Terminology, VR Health and Safety Issues, VR and Society-Medical Applications of VR, Education, Arts and Entertainment, Military VR Applications, Emerging Applications of VR – VR Applications in Manufacturing, Applications of VR in Robotics, Information Visualization, VR in Business, VR in Entertainment, VR in Education.		
Unit V: AUGMENTED REALITY		9 Hrs
Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation-Navigation-Wearable devices.		
Text Books:		
<ol style="list-style-type: none"> Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create compelling VR experiences for mobile”, Packt Publisher, 2018. William R. Sherman, Alan B.Craig, “Understanding Virtual Reality – Interface, Application, Design”, Morgan Kaufmann, 2nd Edition, 2018. Dieter Schmalstieg, Tobias Hollerer, “Augmented Reality: Principles & Practice”, Addison Wesley, 2016. Ali A. Ghorbani, Wei Lu, “Network Intrusion Detection and Prevention: Concepts and Techniques”, Springer, 2010. Paul E. Proctor, “The Practical Intrusion Detection Handbook”, Prentice Hall, 2001. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3	3	3
CO2		3							2	2			2	3	
CO3	3	3	3	2	3				2		2		3	3	
CO4		3	3	3	2					2	3	3		3	3
CO5	3	3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 706	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	GRAPHICS AND IMAGE PROCESSING	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To learn two dimensional graphical structures, the components of Graphics and Image Processing applications. To design innovative applications. 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Describe acquainted Graphics and Image Processing domains		
CO2. Understand the major intricacies of Graphics and Image Processing.		
CO3. Gain knowledge verbal descriptions to images and vice versa		
CO4. Develop graphical structures using various image processing tools.		
CO5. Implement graphics techniques for real time applications.		
Pedagogy: Lectures, Assignments, Case study		
Unit I: GRAPHICS SYSTEMS AND GRAPHICAL USER INTERFACE		9 Hrs
Pixel Resolution types of video display devices- Graphical input devices, Output devices, Hard copy devices, Direct screen interaction, Logical input function, GKS User dialogue, Interactive picture construction techniques.		
Unit II: GEOMETRIC DISPLAY PRIMITIVES AND ATTRIBUTES		9 Hrs
Geometric Display Primitives and Attributes- Geometric display primitives, Points Lines and Polygons, Point display method, Line drawing methods. 2D Transformations and Viewing- Transformations types matrix representation, Concatenation, Scaling Rotation, Translation, Shearing, Mirroring, Homogeneous coordinates. Window to view port transformations- Windowing and Clipping, Point Lines Polygons, boundary intersection methods.		
Unit III: DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS		9 Hrs
Digital Image Fundamentals and Transforms- Nature of Image processing, related fields, Image representations, Image types, Image processing operations, Applications of Image processing, Imaging system, Image Acquisition, Image Sampling and Quantization, Image quality, Image storage and file formats, Image processing operations, Image Transforms, need for Transforms, Fourier Transforms and its properties- Introduction to Walsh, Hadamard, Discrete Cosine, Haar, Slant, SVD, KL and Hotelling Transforms.		
Unit IV: IMAGE ENHANCEMENT AND RESTORATION		9 Hrs
Image Enhancement and Restoration- Image Quality and need for Enhancements, Point operations, Histogram Techniques, Spatial filtering concepts, Frequency Domain Filtering, Image Smoothing, Image Sharpening, Image degradation and Noise Models Introduction to Restoration Techniques.		
Unit V: IMAGE COMPRESSION		9 Hrs
Image Compression- Compression Models and measures, coding types, Types of Redundancy, Lossless compression algorithms, Lossy compression algorithms, Introduction to compression standards. Image Segmentation- Detection of Discontinuities, Edge Detection, Thresholding, Region Based Segmentation- Introduction to Color Image Processing- Introduction to Morphological operations.		
Text Books:		
<ol style="list-style-type: none"> S. Sridhar, “Digital Image Processing”, Oxford Press, 1st Edition, 2011. 2. Donald D. Hearn, M. Pauline Baker and Warren Carithers, “Computer Graphics with OpenGL”, Pearson Education, 4th Edition, 2010. Gonzalez R. C and Woods R.E., “Digital Image Processing”, Pearson Education, 2nd Edition, 2002. 		

4. 2. Newmann W.M. and Sproull R.F., “Principles of Interactive Computer Graphics”, Tata McGraw-Hill, 2nd Edition, 2000.
5. 3. Foley J.D., Van Dam A, Fiener S.K. and Hughes J.F., “Computer Graphics”, Addison-Wesley, 2nd Edition, 1993.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3
	<i>S-Strong (3)</i>			<i>M- Medium (2)</i>				<i>L- Low (1)</i>							

Subject Code BTCB 707	Subject Title	L T P C 3 0 0 3
Cognitive	MOBILE APPLICATION DEVELOPMENT	Minor
Course Objectives:		
<ol style="list-style-type: none"> To understand the mobile application features To deploy applications to the android phone features 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Gain the knowledge about various types of Wireless Data Networks and Voice Networks.		
CO2. Understand the architectures, the challenges and the Solutions of Wireless Network.		
CO3. Communication Realize the role of Wireless Protocols in shaping the future Internet.		
CO4. Develop simple Mobile Application using Android		
CO5. Implement Mobile Application using various platforms.		
Pedagogy: Lectures, Assignments, Case study		
Unit I: INTRODUCTION		9 Hrs
Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA		
Unit II: MOBILE TELECOMMUNICATION AND NETWORK LAYER		9 Hrs
Introduction to Cellular Systems - GSM – Services & Architecture – GPRS -UMTS – Architecture – Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR- AODV - Hybrid routing –ZRP- Multicast Routing- ODMRP-MOBILE TRANS- PORT AND APPLICATION LAYER: Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML.		
Unit III: MOBILE DATABASES		9 Hrs
Issues in Transaction Processing-Transaction Processing Environment-Centralized Environment- Client-server Environment-Distributed Environment-Mobile Environment -Data Dissemination-Transaction Processing in Mobile Environment-Atomicity Relaxation-Consistency Relaxation-Isolation Relaxation-Durability Relaxation.		
Unit IV: MOBILE APPLICATION DEVELOPMENT USING ANDROID		9 Hrs
Mobile Applications Development - Understanding the Android Software Stack – Android Application Architecture –The Android Application Life Cycle – The Activity Life Cycle Creating Android Activity - Views- Layout -Creating User Interfaces with basic views- linking activities with Intents.		
Unit V: MOBILE PLATFORMS AND APPLICATIONS		9 Hrs
Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.		
Text Books:		
<ol style="list-style-type: none"> Prasant Kumar Pattink, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, 2nd Edition, 2016. J. Schiller, “Mobile Communication” , Pearson Education, 2nd Edition, 2014. Iti Saha Misra, “Wireless Communication and Networks:3G and Beyond”, McGraw Hill Education (India) Private Ltd, New Delhi,2nd Edition,2017. Dharma Prakash Agarval, Qing and An Zeng, “Introduction to wireless and Mobile System”, Thomas Asia Pvt Ltd, 2005. William .C.Y.Lee, “Mobile Cellular Telecommunication –Analog and Digital System” Tat aMcGraw Hill Edition, 2nd,2006. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		3		2							1	2	2	2
CO2	1	3			2							1	2	2	2
CO3	1	3	1		2							1	2	2	2
CO4	1		3		2							1	2	2	2
CO5	1	2	3		2							1	2	2	2
Avg	1.4	2.7	2.5		2							1	2	2	2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 708	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	WIRELESS SENSOR NETWORKS	<i>Minor</i>
<p>Course Objectives:</p> <p>1. To learn various protocols for wireless communication networks</p> <p>1. To learn the various wireless communication technologies.</p>		
<p>Course Outcomes:</p> <p>On completion of the course, the students will able to:</p> <p>CO1. Interpret the functioning of wireless communication system.</p> <p>CO2. Elucidate the recent wireless technologies.</p> <p>CO3. Demonstrate multiple access techniques for Wireless Communication</p> <p>CO4. Understand wireless personal area networks.</p> <p>CO5. Evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.</p>		
<p>Pedagogy: Lectures, Assignment, presentations</p>		
<p>Unit I: OVERVIEW OF WIRELESS COMMUNICATION</p> <p>Cellular communication- Different generations and standards in cellular communication system- Satellite communication including GPS-wireless local loop- Cordless phone- paging systems- RFID.</p>		9 Hrs
<p>Unit II: RECENT WIRELESS TECHNOLOGIES</p> <p>Multicarrier modulation- OFDM- MIMO system- Diversity multiplexing trade-off, MIMO-OFDM system, Smart antenna- Beam forming and MIMO-cognitive radio-Software defined radio-Communication relays, Spectrum sharing.</p>		9 Hrs
<p>Unit III: MULTIPLE ACCESS TECHNIQUES IN WIRELESS COMMUNICATION</p> <p>Contention-multiple access schemes -FDMA -TDMA-CDMA- SDMA and Hybrid- Contention based multiple access schemes (ALOHA and CSMA).</p>		9 Hrs
<p>Unit IV: WIRELESS PERSONAL AREA NETWORKS</p> <p>Bluetooth, UWB and ZigBee- Wireless local area networks (IEEE 802.11, Network architecture, Medium access methods, LAN standards), Wireless metropolitan area networks (WiMAX).</p>		9 Hrs
<p>Unit V: AD-HOC WIRELESS NETWORKS</p> <p>Design Challenges in Ad-hoc wireless networks- Concept of cross layer design-Security in wireless networks-Energy constrained networks- MANET and WSN. Wireless system protocols : Mobile network layer protocol (mobile IP, IPv6, dynamic host configuration protocol)- Mobile transport layer protocol (traditional TCP, Classical TCP improvements)- Support for mobility (wireless application protocol).</p>		9 Hrs
<p>Text Books:</p> <p>1. Iti Saha Misra, “Wireless Communication and Networks:3G and Beyond”, McGraw Hill Education (India) Private Ltd, New Delhi, 2nd Edition,2017.</p> <p>2. Sanjay Kumar, “Wireless Communication the Fundamental and Advanced Concepts”, River Publishers, Denmark, 2015.</p> <p>3. Walteneus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks - Theory and Practice”, John Wiley & Sons Publications, 2011.</p> <p>4. J. Schiller, “Mobile Communication”, Pearson Education, 2nd Edition,2014.</p> <p>5. Vijay K Garg, “Wireless Communications and Networks”, Morgan Kaufmann Publishers, USA 2013.</p>		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 709	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	NEXT GENERATION NETWORKS	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To learn the advantages and disadvantages of existing networks and future generation networks. To learn the various multicasting services. 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will able to:</p> <p>CO1. Understand the design of routing mechanism to meet out the desired QoS in NGN.</p> <p>CO2. Analyse IMS architecture, services, convergent management issues in NGN.</p> <p>CO3. Explore various methods of providing connection-oriented services over a NGN with reference to MPLS.</p> <p>CO4. Apply various multicasting services with reference to VPNs, VLANs, pseudo wires, VPLS and typical applications.</p> <p>CO5. Analyze and understand the various NGN management modules.</p>		
<p>Pedagogy: Lectures, Assignment, presentations</p>		
<p>Unit I: WIRELESS IP</p> <p>Evolution of public mobile services - Motivations for IP based services, Wireless IP network Architecture 3GPP packet data network architecture. Introduction to next generation networks – Opportunities and challenges. Technologies-Networks and services-Future trends.</p>		9 Hrs
<p>Unit II: IMS AND CONVERGENT MANAGEMENT</p> <p>IMS Architecture - IMS services-QoS Control and Authentication- Network and Service management for NGN-IMS advantages-Next Generation OSS Architecture - Standards important to OSS architecture-Information framework- OSS interaction with IMS-NGN OSS function/ information view reference model-DMTF CIM..</p>		9 Hrs
<p>Unit III: MPLS and VPN</p> <p>Technology overview –MPLS & QoS- MPLS services and components –layer 2 VPN-layer 2 internetworking-VPN services, Signaling-layer 3 VPN –Technology overview-Remote Access and IPsec integration with MPLS VPN – GMPLS</p>		9 Hrs
<p>Unit IV: MULTICAST</p> <p>MPLS Multicast VPN overview – Applications- Examples-IPv6 and MPLS- Technology overview-Future of MPLS –Integrating IP and optical networks- Future layer 3 services-future layer 2 services-edge computing- Fog-5G-SDN.</p>		9 Hrs
<p>Unit V: NGN MANAGEMENT</p> <p>MPLS Multicast VPN overview – Applications, Examples, IPv6 and MPLS- Technology overview, Future of MPLS –Integrating IP and optical networks, Future layer 3 services, future layer 2 services.</p>		9 Hrs
<p>Text Books:</p> <ol style="list-style-type: none"> Monique J. Morrow, “Next Generation Networks”, CISCO Press, 2007. Robert Wood, “MPLS and Next Generation Networks: Foundations for NGN and Enterprise Virtualization”, CISCO Press, 2006. Thomas Plavyk, “Next generation Telecommunication Networks, Services and Management”, Wiley & IEEE Publications, 2010. Neill Wilkinson, “Next Generation Network Services”, John Wiley Publications, 2002. Press, 2014. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2					2		2	2	1	2
CO2	2	2	2	2	3					2		2	1	2	2
CO3	1	2	1	2	3					2		2	3	1	2
CO4	1	1	1	1	2					1		1	2	1	1
CO5	2	2	2	2	3					2		2	3	1	2
Avg	1.6	1.8	1.6	1.8	2.6	-	-	-	-	1.8	-	1.8	2.2	1.4	1.8

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 710	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	INTERNET OF THINGS	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To learn IoT concepts, architecture and protocols To understand the IEEE protocols for IoT. 		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. understand the architectural overview of IoT.</p> <p>CO2. apply basic knowledge and understanding of Architecture and protocols.</p> <p>CO3. Explore knowledge in network IEEE standards</p> <p>CO4. Elucidate the various IoT Protocols like Datalink, Network, Transport, Session, Service layers.</p> <p>CO5. Analyze and understand the IoT Reference Architecture and Real World Design Constraints.</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: OVERVIEW OF IOT		9 Hrs
<p>An Architectural Overview– Building an architecture- Main design principles-needed capabilities- An IoT architecture outline- Standards considerations. M2M and IoT Technology. Fundamentals- Devices and gateways- Local and wide area networking- Data management-Business processes in IoT- Everything as a Service(XaaS)- M2M and IoT Analytics-Knowledge Management.</p>		
Unit II: REFERENCE MODEL		9 Hrs
<p>IoT Architecture-State of the Art – Introduction, State of the art- Reference Model and architecture- IoT reference Model - IoT Reference Architecture- Introduction-Functional View-Information View-Deployment and Operational View- Other Relevant architectural views. Real-World Design Constraints-Introduction- Technical Design constraints-Hardware is popular again-Data representation and visualization, Interaction and remote control.</p>		
Unit III: IoT DATA LINK LAYER & NETWORK LAYER PROTOCOLS		9 Hrs
<p>PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15)-Wireless HART- ZWave- Bluetooth Low Energy- Zigbee Smart Energy, DASH7 - Network Layer-IPv4- IPv6- 6LoWPAN- 6TiSCH-ND- DHCP- ICMP- RPL- CORPL- CARP.</p>		
Unit IV: TRANSPORT & SESSION LAYER PROTOCOLS		9 Hrs
<p>Transport Layer (TCP- MPTCP- UDP-DCCP-SCTP)-(TLS- DTLS) – Session Layer HTTP-CoAP- XMPP-AMQP-MQTT.</p>		
Unit V: SERVICE LAYER PROTOCOLS & SECURITY		9 Hrs
<p>Service Layer -OneM2M-ETSI M2M-OMA-BBF – Security in IoT Protocols – MAC 802.15.4 - 6LoWPAN- RPL- Application Layer.</p>		
Text Books:		
<ol style="list-style-type: none"> Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri, “Internet of Things: Architectures, Protocols and Standards”, 1st Edition, 2018. BK Tripathy and J.Anuradha, “Internet Of Things (IoT) Technologies Applications Challenges And Solutions”, Taylor & Francis, 1st Edition, 2017. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM, MUMBAI, 1st Edition, 2015. 		

4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, Academic Press, 1st Edition,2014.
5. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, Springer, 1st Edition, 2011.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2					2		2	2	1	2
CO2	2	2	2	2	3					2		2	1	2	2
CO3	1	2	1	2	3					2		2	3	1	2
CO4	1	1	1	1	2					1		1	2	1	1
CO5	2	2	2	2	3					2		2	3	1	2
Avg	1.6	1.8	1.6	1.8	2.6	-	-	-	-	1.8	-	1.8	2.2	1.4	1.8

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 711	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	OPTIMIZATION TECHNIQUES	<i>Minor</i>
Course Objectives:		
<p>1. To introduce the basic concepts of linear, non-programming, an interior point and dynamic programming</p> <p>1. To learn the various Optimization Techniques.</p>		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. Interpret the linear programming model and acquire management skills.</p> <p>CO2. apply the theory of optimization methods and algorithms.</p> <p>CO3. Explore the non -linear programming.</p> <p>CO4. Apply karmarkar’s algorithm and optimization techniques in problems of Engineering and Technology.</p> <p>CO5. Analyze dynamic programming and appreciate variety of performance measures for various optimization problems.</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: LINEAR PROGRAMMING		9 Hrs
Introduction- Formulation of linear programming model- Graphical solution- Solving LPP using simplex algorithm-Revised Simplex Method.		
Unit II: ADVANCES IN LPP		9 Hrs
Dual theory- Dual simplex method- Sensitivity analysis- Transportation problems- Assignment problems- Traveling sales man problem- Data Envelopment Analysis.		
Unit III: NON LINEAR PROGRAMMING		9 Hrs
Classification of Non Linear programming-Lagrange multiplier method- Karush, Kuhn Tucker conditions- Reduced gradient algorithms-Quadratic programming method-Penalty and Barrier method.		
Unit IV: INTERIOR POINT METHODS		9 Hrs
Karmarkar’s algorithm- Projection Scaling method-Dual affine algorithm-Primal affine algorithm Barrier algorithm.		
Unit V: DYNAMIC PROGRAMMING		9 Hrs
Formulation of Multi stage decision problem- Characteristics- Concept of sub- Optimization and the principle of optimality-Formulation of Dynamic programming- Backward and Forward recursion- Computational procedure-Conversion of final value problem in to Initial value problem.		
Text Books:		
<ol style="list-style-type: none"> 1. Sultan Chand and Sons, “Operations Research”, Sultan Chand and Sons, 2019. 2. L. R. Foulds, “Optimization Techniques”, Softcover reprint of the original, 1st Edition, 2011. 3. Chander Mohan and Kusum Deep, “Optimization Techniques”, New Age Science Ltd, 2009. 4. Philips, Ravindran and Solberg, “Operations Research”, John Wiley, 2019. 5. Ronald L.Rardin, “Optimization in Operation Research”, Pearson Education Pvt.Ltd., 2018. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code	Subject Title	L T P C
BTCB 712		3 0 0 3
<i>Technical</i>	DEEP LEARNING	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To introduce theoretical foundations, algorithms, methodologies in deep learning. To design and develop an application-specific deep learning models with practical knowledge 		
Course Outcomes:		
On completion of the course, the students will be able to:		
CO1. Understand the basic concept of neural networks and deep learning		
CO2. Recognize the characteristics of deep learning models that are useful to solve real-world problems.		
CO3. Examine different methodologies to create application-specific Deep Neural Networks		
CO4. Analyze the key computations of deep learning and use them to train deep neural networks for various tasks.		
CO5. Implement CNN, RNN and Deep generative model.		
Pedagogy: Lectures, Assignments, Case study		
Unit I: INTRODUCTION		8 Hrs
Learning Algorithms, Building machine learning algorithm, Biological Neuron, Neural Network, Linear separability, Linear perceptron, Stochastic Gradient Descent, Multilayer Perceptron, Backpropagation algorithm, Curse of Dimensionality.		
Unit II: DEEP LEARNING TECHNIQUES		9 Hrs
Machine Learning Vs. Deep Learning, Representation Learning, Width Vs. Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Regularization- dropout, drop connect, optimization methods for neural networks-Adagrad, adadelata, rmsprop, adam, NAG.		
Unit III: CONVOLUTIONAL NEURAL NETWORKS & TRANSFER LEARNING		10 Hrs
Architectural Overview – Motivation - Layers – Filters – Parameter sharing – Regularization, Popular CNN Architectures: LeNet, ResNet, Vggnet, AlexNet. Transfer learning Techniques -DenseNet, PixelNet.		
Unit IV: TRAINING NEURAL NETWORKS		10 Hrs
Deep Learning Hardware and Software - CPUs, GPUs, TPUs, PyTorch, TensorFlow, Dynamics Static computation graphs, Data Pre-processing-Data Augmentation, batch normalization, Transfer Learning- Deep Transfer Learning Strategies, Update rules, hyperparameter tuning, Learning rate scheduling, variants of CNN- ResNet, GoogleNet, Xception, etc		
Unit V: DEEP RECURRENT NEURAL NETWORK		8 Hrs
Recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures, Deep Recurrent Networks, Recursive Neural Networks, Long Short Term Memory Networks.		
Text Books:		
<ol style="list-style-type: none"> Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2017. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017 Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" Apress, 2018. 		
Giancarlo Zaccane, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3			1						2		1	2	1
CO2	3	1								2	2				2
CO3	3	3	2	3	3				2		2	1	3	3	1
CO4	3	1	3	2		2	1			2	2	2	2		
CO5	3	3	2	3	3				2		2	1	3	3	1
Avg	3	2.2	1.3	1.7	1.3	2	1		2	2	2	1.3	2.3	1.7	1.3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 713	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	KNOWLEDGE ENGINEERING	<i>Minor</i>
Course Objectives:		
1. To deal with knowledge acquisition, representation, validation, inference, explanation and maintenance. 2. To design and develop ontologies.		
Course Outcomes:		
On completion of the course, the students will be able to: CO1. Understand the basics of Knowledge Engineering. CO2. Apply methodologies and modelling for agent design and development. CO3. Design and develop ontologies CO4. apply reasoning with ontologies and rules CO5. Elucidate about learning and rule learning.		
Pedagogy: <i>Lectures, Assignments, Case study</i>		
Unit I: REASONING UNDER UNCERTAINTY		9 Hrs
Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering.		
Unit II: METHODOLOGY AND MODELING		9 Hrs
Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill- Down Analysis, Assumption-based Reasoning, and What-If Scenarios.		
Unit III: ONTOLOGIES DESIGN AND DEVELOPMENT		9 Hrs
Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.		
Unit IV: REASONING WITH ONTOLOGIES AND RULES		9 Hrs
Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.		
Unit V: LEARNING AND RULE LEARNING		9 Hrs
Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.		
Text Books:		
1. Ela Kumar, “Knowledge Engineering”, IK International Publisher House, 2018. 2. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, “Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning”, Cambridge University Press, 1st Edition, 2016. 3. Michael K. Bergman, “Knowledge Representation and Reasoning”, 2018. 4. King , “Knowledge Management and Organizational Learning”, Springer, 2009. 5. Ronald J. Brachman, Hector J. Levesque, “Knowledge Representation and Reasoning”, Morgan Kaufmann, 2004.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	3		1				1	3	3	2
CO2	3	3	3	3	3	3		1				1	3	3	2
CO3	2	2	3	3	3	3		1				1	3	3	2
CO4	2	2	3	2	2	3		1				1	3	3	1
CO5	2	2	3	2	3	3		1				1	3	3	1
Avg	2.2	2.2	2.6	2.4	2.4	3		1				1	3	3	1.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 714	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	NATURAL LANGUAGE PROCESSING	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To read, understand and decode human words in a valuable manner. To learn the various syntactic and semantic analysis. 		
Course Outcomes:		
<p>On completion of the course, the students will be able to:</p> <p>CO1. Understand given text with basic Language features.</p> <p>CO2. Design an innovative application using NLP components.</p> <p>CO3. Implement a rule based system to tackle morphology/syntax of a language.</p> <p>CO4. Apply and design a tag set to be used for statistical processing for real-time applications.</p> <p>CO5. Compare and contrast the use of different statistical approaches for different types of NLP applications.</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: INTRODUCTION		9 Hrs
Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology- Transducers for lexicon and rules-Tokenization, Detecting and Correcting Spelling Errors-Minimum Edit Distance.		
Unit II: WORD LEVEL ANALYSIS		9 Hrs
Unsmoothed N-grams- Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging- Issues in PoS tagging – Hidden Markov and Maximum Entropy models.		
Unit III: SYNTACTIC ANALYSIS		9 Hrs
Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG- Probabilistic CYK-Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.		
Unit IV: SEMANTICS AND PRAGMATICS		9 Hrs
Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis-Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.		
Unit V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES		9 Hrs
Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer- Lemmatizer- Penn Treebank, Brill’s Tagger-WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).		
Text Books:		
<ol style="list-style-type: none"> Daniel Jurafsky, James H. Martin—Speech and Language Processing: “An Introduction to Natural Language Processing, Computational Linguistics and Speech”, Pearson Publication, 2014. Steven Bird, Evan Klein and Edward Loper, “Natural Language Processing with Python”, O’Reilly Media, 1st Edition, 2009. S.N.Sivanandham and M Paulraj, “Introduction to Artificial Neural Networks”, Vikas Publishing, 2023. Breck Baldwin, “Language Processing with Java and LingPipe Cookbook”, Atlantic Publisher, 2015. Richard M Reese, “Natural Language Processing with Java ”, O’Reilly Media, 2015. 2007. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	3		1				1	2	2	3
CO2	3	3	3	3	3	3		1				1	2	2	3
CO3	2	2	3	3	3	3		1				1	3	3	3
CO4	2	2	3	2	2	3		1				1	3	3	3
CO5	2	2	3	2	3	3		1				1	3	3	3
Avg	2.2	2.2	2.6	2.4	2.4	3		1				1	2.6	2.6	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 715	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	ARTIFICIAL NEURAL NETWORKS	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To introduce models of ANN for solving simple pattern recognition problems. To learn the various neural network algorithms. 		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. Understand the building blocks of Neural networks.</p> <p>CO2. Provide the application areas of neural networks</p> <p>CO3. Develop neural network models.</p> <p>CO4. Apply knowledge of learning networks for real-time applications.</p> <p>CO5. Design and develop applications using neural networks</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: INTRODUCTION		9 Hrs
Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem- XOR Problem, Multilayer Networks. Learning: Learning Algorithms- Error correction and Gradient Descent Rules- Learning objective of TLNs, Perceptron Learning Algorithm- Perceptron Convergence Theorem.		
Unit II: SUPERVISED LEARNING		9 Hrs
Perceptron learning and Non Separable sets, alpha -Least Mean Square Learning, MSE Error surface- Steepest Descent Search- μ -LMS approximate to gradient descent- Application of LMS to Noise Cancelling, Multi-layered Network Architecture, Back propagation Learning Algorithm-Practical consideration of BP algorithm.		
Unit III: SUPPORT VECTOR MACHINES AND RADIAL BASIS FUNCTION		9 Hrs
Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification, Radial Basis Function Regularization theory, Generalized RBF Networks- Learning in RBFNs- RBF application to face recognition.		
Unit IV: ATTRACTOR NEURAL NETWORKS		9 Hrs
Associative Learning, Attractor Associative Memory, Linear Associative memory, Hopfield Network- Application of Hopfield Network- Box neural Network, Simulated Annealing, Boltzmann Machine - Bidirectional Associative Memory.		
Unit V: SELF-ORGANIZATION FEATURE MAP		9 Hrs
Maximal Eigenvector Filtering, Extracting Principal Components Generalized Learning Laws, Vector Quantization, Self-organization, Feature Maps, Application of SOM, Growing Neural Gas.		
Text Books:		
<ol style="list-style-type: none"> Satish Kumar, “Neural Networks”, McGraw Hill Education, 2nd Edition, 2017. B. Yegnanarayana, “Artificial Neural Networks”, PHI, 2012. J.M. Zurada, “Introduction to Artificial Neural Systems”, Jaico Publications, 2010. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	3		1				1	3	3	2
CO2	3	3	3	3	3	3		1				1	3	3	2
CO3	2	2	3	3	3	3		1				1	3	3	2
CO4	2	2	3	2	2	3		1				1	3	3	1
CO5	2	2	3	2	3	3		1				1	3	3	1
Avg	2.2	2.2	2.6	2.4	2.4	3		1				1	3	3	1.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 716	Subject Title	L T P C 3 0 0 3
<i>Technical</i>	MULTIMEDIA AND ANIMATION	<i>Minor</i>
Course Objectives:		
1. To introduce the fundamental elements of multimedia to learn representations, perceptions and applications 2. To emphasize hands-on in digital media.		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Understand the basics of Multimedia platform. CO2. Elucidate the different types of file formats in Multimedia. CO3. Use different standard animation techniques for 2D and 3D applications. CO4. Deploy multimedia tools on various platforms. CO5. Analyze about various Multimedia Applications.		
Pedagogy: Lectures, Assignment, presentations		
Unit I: INTRODUCTION TO MULTIMEDIA		9 Hrs
Definitions- Elements, Multimedia Hardware and Software, Distributed multimedia systems-challenges- Security, sharing / distribution, Storage, Retrieval, processing, Computing- Multimedia metadata- Multimedia databases, Hypermedia, Multimedia Learning.		
Unit II: MULTIMEDIA FILE FORMATS AND STANDARDS		9 Hrs
File formats – Text-, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.		
Unit III: MULTIMEDIA AUTHORIZING		9 Hrs
Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning, Simulations.		
Unit IV: ANIMATION		9 Hrs
Principles of animation- Staging-squash and stretch, timing, onion skinning, secondary action, 2D, 2½ D, and 3D animation, Animation techniques- Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, Vector animation, Stop motion, Motion graphics, Fluid Simulation, Skeletal animation, Skinning Virtual Reality, Augmented Reality.		
Unit V: MULTIMEDIA APPLICATIONS		9 Hrs
Multimedia Big data computing- social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, Media on demand, Security and forensics, Online social networking, Multimedia ontology, Content based retrieval from digital libraries.		
Text Books:		
1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, “Fundamentals of Multimedia”, Springer Texts in Computer Science, 3rd Edition, 2021. 2. Emilio Rodriguez Martinez, Mireia Alegre Ruiz, “UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native”, Packt Publishing, 2022. 3. Mohsen Amini Salehi, Xiangbo Li, “Multimedia Cloud Computing Systems”, Springer Nature, 1st Edition, 2021.		

4. Gerald Friedland, Ramesh Jain, “Multimedia Computing”, Cambridge University Press, 2018.
5. John M Blain, “The Complete Guide to Blender Graphics: Computer Modeling & Animation”, CRC press, 3rd Edition, 2016.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3								3		
CO2	3	3	3	3	3					2			2	3	
CO3	3	3	3	2	3				2		2		3	3	
CO4	3	3	3	3	2						3	3	3	3	3
CO5	3	3	3	3			3	3			3	2	3		3
Avg	3	3	3	2.8	2.8	-	3	3	2	2	2.7	2.5	2.8	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 717	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	FINANCIAL MODELLING	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To learn the various Financial Analysis. To understand the methods of various Financial Analysis. 		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. Gain the knowledge to analyze and build Financial Models.</p> <p>CO2. Acquire the practical knowledge to build models for assessing the financial positions of firms.</p> <p>CO3. Explore the need of financial analysis and decision making.</p> <p>CO4. Understand the financial modelling corporate finance.</p> <p>CO5. Analyze the advanced financial optimization techniques.</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: Introduction to Financial Modeling		9 Hrs
Introduction to a spreadsheet, database functions in a spreadsheet, finance function in a spreadsheet- Basic Excel functions and shortcuts- Basic Financial Calculations – Modelling best practices- Essential Tools and Formulas- Formatting Color Coding		
Unit II: Building Financial Models in Excel		9 Hrs
Building a basic financial model- Formatting and presenting financial models- Date Functions for Finance- Lookup Functions-Formatting of Basic Model- Developing a good model – Multipage calculations		
Unit III: Financial Analysis and Decision Making		9 Hrs
Overview of the income statement, balance sheet, and cash flow statement-Forecasting financial statements using historical data- Sensitivity analysis and scenario analysis- Goals Seeking- One-way and Two-Way table- Break Even- Calculating		
Unit IV: Financial Modeling in Corporate Finance		9 Hrs
Financial modeling in capital budgeting- Financial modeling in mergers and acquisitions- NVA-NPV		
Unit V: Advanced Financial Modeling Techniques		9 Hrs
Monte Carlo simulation- Optimization modeling- Forecasting using time series analysis-Application of Statistical tools for financial calculations and Model Building through Excel Add on		
Text Books:		
<ol style="list-style-type: none"> Benninga, Simon. Financial modeling. MIT press. Proctor, K. Scott., Building financial models with Excel: A guide for professionals. Day, Alastair. Mastering cash flow and valuation modelling. Pearson UK. Sengupta, Chandan. Financial analysis and modeling using Excel and VBA. Vol. 456. John Wiley Sons. Yeo, Julian, Financial statement analysis. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 718	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	FOREX AND CURRENCY DERIVATIVES	Minor
Course Objectives:		
1. To introduce concepts and theories related to Forex and Currency Derivatives 2. To facilitate the application of the concepts and theories into practice in the field of Forex Trading		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Understand and appreciate the concepts of Forex and Currency Management CO2. Acquire required knowledge and demonstrate skills sets required for Forex Trading. CO3. Explore the various foreign exchange transactions. CO4. Understand the exchange rates and cash position. CO5. Analyze the currency derivative concepts.		
Pedagogy: Lectures, Assignment, presentations		
Unit I: Foreign Exchange Market		9 Hrs
Organisation – Spot Vs Forward Markets – Bid and Ask rates – Interbank Quotations – International Market Quotations – Cross Rates – Merchant Rates – FEDAI Regulations – Role of RBI.		
Unit II: Exchange Rates		9 Hrs
Exchange rate systems – Gold Standard – Bretton Woods – Fixed Vs Floating Exchange Rate systems – Determinants of Exchange Rates – Exchange Controls.		
Unit III: Foreign Exchange Transactions		9 Hrs
Overview of the income statement, balance sheet, and cash flow statement-Forecasting financial statements using historical data- Sensitivity analysis and scenario analysis- Goals Seeking- One-way and Two-Way table- Break Even- Calculating		
Unit IV: Ready and Forward Exchange Rates		9 Hrs
Principle types of Ready Merchant rates – Ready rates based on cross rates – Forward exchange contracts – Execution of Forward contracts – cancellation and Extensions - Dealing position – Exchange position – Cash position		
Unit V: Currency Derivatives		9 Hrs
Currency Forwards – Currency Futures – Currency Options – Exchange traded transactions – Financial Swaps – Forward Rate agreements – Interest Rate Options.		
Text Books:		
1. Alan C Shapiro: Multinational Financial Management, Prentice Hall, New Delhi 2. Francis Cherunilam : International Economics, Tata Mc Graw Hill Pub Ltd, New Delhi 3. Ian H Giddy: Global Financial Markets, AITBS Publishers and Distributors, New Delhi 4. C Jeevanandam, Foreign Exchange: Practice, Concepts, Sultan Chand & Sons, New . Delhi 5. Vijayabhaskar P and Mahapatra B., Derivatives Simplified, Respose Books, Sage Publications, New Delhi		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2	3	3								2			2	3	
CO3	3	3	3	2	3				2		2		3	3	
CO4	3	3	3	3	2						3	3		3	3
CO5	3	3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3
	<i>S-Strong (3)</i>			<i>M-Medium (2)</i>				<i>L-Low (1)</i>							

Subject Code BTCB 719	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	RETAIL BANKING	Minor
Course Objectives:		
1. To introduce and expose the key issues in rural banking. 2. To introduce various Government initiatives for inclusive financial system.		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Gain knowledge on rural financing and development policy. CO2. Acquire practical knowledge on problems and prospects in rural banking. CO3. Explore the various retail products and services. CO4. Understand the regulations and compliance of retail banking. CO5. Elucidate the developments in retail banking.		
Pedagogy: Lectures, Assignment, presentations		
Unit I: Introduction to Retail Banking		9 Hrs
Meaning and definition, Retail Vs. Corporate/ Wholesale Banking – Commercial banks - Regulatory Framework – RBI guidelines – Emerging trends - Business Intelligence and analytics – New product development – Product customization - Role of technology in retail banking		
Unit II: Retail Products and Services		9 Hrs
Customer requirement and products development process –Approval process for retail loans - credit scoring -Asset Products - Home Loans, Vehicle Loans, Personal Loans, Educational Loan, Credit Card, Debit card,- Eligibility, Purpose, Amounts, Margin, Security, Disbursement, Moratorium, Repayment, Prepayment - Credit Vs Debit Cards - Eligibility, Purpose, Amounts, Margin, Security, Billing Cycle, Credit Points - Other Products – Remittances, Funds Transfer etc. – Record keeping and documentation procedures.		
Unit III: Marketing of Retail Products		9 Hrs
Retail Strategies - Tie-ups with Institutions, OEMs, Builders etc. - Delivery Channels - Branch, ATMs, POS, Internet Banking, M-Banking etc. Selling Process - Direct Selling Agents - Customer Relationship Management.		
Unit IV: Regulations and Compliance		9 Hrs
Account opening – AML and KYC norms – NPA Norms – Recovery of Retail Loans - defaults, rescheduling, recovery process - SARFAESI Act, DRT Act, Lok Adalat forum - Recovery Agents - Outsourcing - RBI guidelines - CIBIL Procedures.		
Unit V: Retail Banking Developments		9 Hrs
Securitization, Mortgage based securities, New products -Insurance, Demat services, online / Phone Banking, Property services, Investment advisory/ Wealth management, Reverse Mortgage - Cross selling opportunities.		
Text Books:		
1. O.P.Agarwal, Fundamentals of Retail Banking, Himalaya Publishing House. 2. IIBF, Retail Banking, MacMillan Education. 3. IIBF, Retail Banking & wealth management, MacMillan Education. 4. Keith Pond, Retail Banking, Gosbrook Professional Publishing. 5. Suresh Samudrala, Retail Banking Technology, Jaico Publishing House.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		2	2	1	1	1	1	1	2	2	3	2	2
CO2	3	3		2	2	1	1	1	1	1	2	2	3	2	2
CO3	3	3		3	3	2	2	2	2	2	3	3	3	3	3
CO4	3	3		3	3	2	2	2	2	2	3	3	3	3	3
CO5	3	3		3	3	2	2	2	2	2	3	3	3	3	3
Avg	3	3		2.6	2.6	1.6	1.6	1.6	1.6	1.6	2.6	2.6	3	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 720	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	CENTRAL BANKING & POLICY DEVELOPMENT	<i>Minor</i>
Course Objectives:		
1. To introduce the concepts on central banking and monetary policy 2. To introduce various functions of the monetary Policy and the role of Central Banks in the Economy.		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Understand the concepts of central banking and its importance in floating economy. CO2. Acquire knowledge and understanding of central banking operations. CO3. Explore the need of monetary policies. CO4. Illustrate the open economy using macroeconomics. CO5. Identify the various challenges for monetary policy.		
Pedagogy: Lectures, Assignment, presentations		
Unit I: Introduction to RBI and Conventional Central Banking		9 Hrs
Establishment of RBI and RBI Act, 1934 - RBI as the Apex Bank in the Indian Banking System – Conventional central banking functions of RBI: Issue of Currency – Lender of Last Resort – Regulator and Supervisor of Banks – Payment and Settlement System - Government Debt Management – Management of Forex and Foreign Exchange Rate – Conduct of Monetary Policy		
Unit II: RBI as Regulator and Supervisor of the Banks in India		9 Hrs
Rationale for Banking Regulation – Various forms of Banking Regulations in India: bank licensing – LOLR - deposit insurance – Capital adequacy requirements under Basel norms – Prudential regulations on asset quality, income recognition and provisioning – Rationale for Banking Supervision – Onsite inspection and off-site surveillance by RBI – CAMELS		
Unit III: Conduct of Monetary Policy		9 Hrs
Overview of Theories of Money Demand and Money Supply – Role of Commercial Banks in Money Creation under Partial Reserve System – RBI's Control on Money Supply and Determination of Interest Rates – Monetary Policy framework: Objectives, Instruments and Targets – Channels of Monetary Transmission – RBI's Monetary Policy Operating Procedure – RBI's Inflation Targeting framework.		
Unit IV: RBI Functions and Debt Management		9 Hrs
Rbi as banker to the government - Public Debt Management - Government Securities market - fiscal and money coordination.		
Unit V: External Sector Management and RBI		9 Hrs
Overview of Open-economy Macroeconomics – Economic Reforms in India and liberalization of international capital flows – Market oriented exchange rate management – Challenges for conduct of monetary policy under Impossible Trinity – RBI's balancing act.		
Text Books:		
1. Blinder, Alan S., Central banking in theory and practice, Mit press 2. Mishkin, Frederic S., Economics of Money, Banking and Financial Markets, Pearson Education, 11th Edition. 3. Gans, Joshua, Robin Stone cash, Martin Byford, Gregory Mankiw, Stephen King, and Jan Libich, Principles of economics, Cengage AU. 4. Samantaraya, Amaresh (2024): Functions, Regulations and Management of Banks in India, Cambridge University Press (Forthcoming).		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		2	2	1	1	1	1	1	2	2	3	2	2
CO2	3	3		2	2	1	1	1	1	1	2	2	3	2	2
CO3	3	3		3	3	2	2	2	2	2	3	3	3	3	3
CO4	3	3		3	3	2	2	2	2	2	3	3	3	3	3
CO5	3	3		3	3	2	2	2	2	2	3	3	3	3	3
Avg	3	3		2.6	2.6	1.6	1.6	1.6	1.6	1.6	2.6	2.6	3	2.6	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 721	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	CORPORATE RESTRUCTURING	<i>Minor</i>
Course Objectives:		
<ol style="list-style-type: none"> To create awareness on understanding concepts and principles To provide expert knowledge of legal, procedural and practical aspects of Corporate Restructuring 		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. Understand practical aspects and intent of law relating to Corporate Restructuring.</p> <p>CO2. Acquire knowledge of the legal, procedural and practical aspects of Corporate Restructuring.</p> <p>CO3. Explain the concepts of mergers and acquisition.</p> <p>CO4. Explore the need for demergers and takeovers.</p> <p>CO5. Analyze the effects of restructuring.</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: Introduction to concepts		9 Hrs
Meaning of corporate restructuring, need, scope and modes of restructuring - Historical background - National scenario and Global scenario. Planning, formulation and execution of various corporate restructuring strategies – Concepts of Mergers, Acquisitions, Takeovers, Disinvestments, Strategic alliances, Demergers, & Hiving off. Revival, Rehabilitation and Restructuring of Sick Companies - Sick companies and their revival with special reference to the law and procedure relating to sick companies.		
Unit II: MERGERS AND ACQUISITIONS		9 Hrs
Concept; legal, procedural, economic, accounting, taxation and financial aspects of mergers and amalgamations including stamp duty and allied matters; interest of small investors; merger aspects under competition law; jurisdiction of courts; filing of various forms; Amalgamation of banking companies and procedure related to Government companies; Cross border mergers – Latest Merger and Acquisition cases and status.		
Unit III: TAKEOVERS		9 Hrs
Meaning, concept & types of takeovers - legal aspects - SEBI takeover regulations; procedural, economic, financial, accounting and taxation aspects; stamp duty and allied matters; payment of consideration; bail out takeovers and takeover of sick units; takeover defences; cross border takeovers – Examples of Recent Takeovers and the status.		
Unit IV: CORPORATE DEMERGERS AND REVERSE MERGERS		9 Hrs
Concept of demerger; modes of demerger - by agreement, under scheme of arrangement; demerger and voluntary winding up; legal and procedural aspects; tax aspects and reliefs; reverse mergers – procedural aspects and tax implications. Revival, Rehabilitation and Restructuring of Sick Companies - Sick companies and their revival with special reference to the law and procedure relating to sick companies - Examples of recent demergers and the status		
Unit V: CHANGING WORLD AND ITS EFFECT ON RESTRUCTURING		9 Hrs
Globalisation: Dominance of Services economy; technological and communication advancement; Expansion of Financing opportunities and Financial Innovations; expanding role of professionals. Corporate Restructuring in Challenging Times: Financial Mis-governance; Liquidity Crunch, Sub Prime Crises; Global Recession; Solutions for Business Failures.		
Text Books:		
<ol style="list-style-type: none"> 1. Rabi Narayan & Kar, Minakshi, Mergers Acquisitions & Corporate Restructuring Strategies & Practices , Taxmann publications 		

2. K.R. Sampath, Mergers, Amalgamations, Takeovers, Joint Ventures, LLPs and Corporate Restructure, Snow White Publications

3. Ray.J, Mergers and Acquisitions Strategy, Valuation and Integration, PHI publications
4. K.R. Chandratre (Dr.), Corporate Restructuring, Bharat Law House Pvt. Ltd
5. ICSI's Handbook on Mergers Amalgamations and Takeovers

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 722	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	MERCHANT BANKING AND FINANCIAL SERVICES	<i>Minor</i>
Course Objectives:		
1. To introduce the basics of debt markets and treasury operations. 2. To provide the skills required to calculate yields, bond values etc.		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Acquire the knowledge related to Treasury and Debt instruments CO2. Gain the practical knowledge to work in the treasury divisions of the banks. CO3. Explore the need of government securities. CO4. Understand the strategies of bond portfolio management. CO5. Explain the concepts of fixed income derivatives.		
Pedagogy: Lectures, Assignment, presentations		
Unit I: Debt Instruments		9 Hrs
Fundamental Features–Indian Debt Markets–Market segments– Participants -Secondary Market for Debt instruments – Bond Market – SEBI (Disclosure and Investor Protection) guidelines 2008		
Unit II: Analysis and Valuation of Bonds		9 Hrs
Pricing of bonds – Measuring yields – Bond price volatility – Factors affecting bond yields and the term structure of interest rates.		
Unit III: Bond Portfolio Management Strategies		9 Hrs
Passive management strategies–Active management strategies – Global fixed income investment strategy – Core-plus bond portfolio management – Matched-funding Techniques		
Unit IV: Central Govt. Securities		9 Hrs
G - Secs–Tenor and Yields–Primary Issuance Process, Participants–SGL accounts – Dealers – Secondary Market – Negotiated Dealing system – T bills – Cut off Yields – State Govt. Bonds – Money market instruments -Call Money Markets– Participants		
Unit V: Fixed Income Derivatives		9 Hrs
Meaning–Types–Mechanics for forward rate agreements–Guidelines for exchange traded interest rate derivatives.		
Text Books:		
1. Frank J. Fabozzi, Bond Markets, Analysis and Strategies, Pearson 2. Reilly, Brown, Investment Analysis and Portfolio Management, CengageLearning 3. Fixed-Income Securities. L. Martellini, P. Priaulet and S. Priaulet. John Wiley & Sons 4. Website of National Stock Exchange. 5. Steven M Braggs —Treasury Management: The Practical Guide, Wiley.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3									3				3	
CO2		3				3							3		
CO3			3		3										3
CO4				3									3		
CO5								3	3						3
Avg	3	3	3	3	3	3	-	3	3	3	-	-	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 723	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	CORPORATE GOVERNANCE & BUSINESS ETHICS	<i>Minor</i>
<p>Course Objectives:</p> <ol style="list-style-type: none"> To introduce concepts and theories related to – Corporate Governance and Ethical practices. To facilitate the application of governance practices and ethical standards. 		
<p>Course Outcomes:</p> <p>On completion of the course, the students will able to:</p> <p>CO1. Understand and appreciate the concepts of good governance and ethics</p> <p>CO2. Acquire required knowledge about theories and philosophies of corporate governance.</p> <p>CO3. Explore the need of corporate social responsibility.</p> <p>CO4. Demonstrate best practices and ethical standards.</p> <p>CO5. Elucidate the importance of ethics and values in Business.</p>		
<p>Pedagogy: Lectures, Assignment, presentations</p>		
<p>Unit I: Introduction</p> <p>Corporate Governance- governance and management- Separation of ownership -Agency theory- Theories and philosophies of corporate governance -Agency theory-Agency Dilemma-Stewardship theory-resources dependency theory- Societal Perspective-Organisational perspective</p>		9 Hrs
<p>Unit II: Directorship</p> <p>Constitutions of corporate entities-Appointment of directors-Chairman and CEO- CEO duality-Independent Directors- Role of Independent Directors- Board Structures-Board Committees -Functions of Boards-Board Disclosures-Family Business and Board- Delegation of board functions-RBI regulations-SEBI regulations-Fit and proper criteria -Board room- Board room reality-Board effectiveness.</p>		9 Hrs
<p>Unit III: Corporate Governance Codes</p> <p>Cadbury Codes- Sarbanes Oxley Act- Indian corporate governance codes- Role of Ministry- Role of RBI- Role of SEBI- Codes for individual Directors- Best Practices-Corporate governance in India-Successful Governance- Governance index-OECD codes.</p>		9 Hrs
<p>Unit IV: Corporate Social Responsibility</p> <p>Expectations- CSR strategies and policies- CSR Reporting- Sustainable reporting- CSR in India- CSR regulations and policies- Voluntary CSR- Code of conducts- CSR audit.</p>		9 Hrs
<p>Unit V: Ethics in Business</p> <p>Ethics and values-Ethical Philosophies-Code of ethics-Building moral content- Business ethics- ethics for management-Directors- committee.</p>		9 Hrs
<p>Text Books:</p> <ol style="list-style-type: none"> Tricker, RI Bob, and Robert Ian Tricker, Corporate governance: Principles, policies, and practices, Oxford University Press. Mathur, U. C, Corporate Governance And Business Ethics: Text And Cases, Macmillan. Fernando, A. C, Business ethics: An Indian perspective, Pearson Education. DesJardins, Joseph R., and Joseph R. DesJardins, An introduction to business ethics, McGraw-Hill Higher Education. Mallin, Christine A., Handbook on Corporate Governance in Financial Institutions, Edward Elgar Publishing. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 724	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	CYBER CRIMES AND IT LAWS	<i>Minor</i>
Course Objectives:		
1. To explore about the various cybercrimes in real world and banks 2. To learn the various cyber forensics tools, cryptographic techniques for cyber security.		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Interpret and understand the various cybercrimes. CO2. Elucidate the various cyber frauds and attacks. CO3. Explore the need and use of cyber forensic tools. CO4. Apply preventive security controls and cryptographic techniques based on crime identified. CO5. Analyze and identify the IT Laws for cyber security attacks.		
Pedagogy: Lectures, Assignment, presentations		
Unit I: INTRODUCTION TO CYBER CRIME		9 Hrs
Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes		
Unit II: ATTACKS AND COUNTERMEASURES		9 Hrs
OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.		
Unit III: INTRUSION DETECTION		9 Hrs
Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.		
Unit IV: INTRUSION PREVENTION		9 Hrs
Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.		
Unit V: LAWS FOR CYBER SECURITY		9 Hrs
A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment. Civil and criminal liability of cybercrime - Challenges of legislative, law enforcement and justice system – Indian and International Initiatives.		
Text Books:		
1. Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021. 2. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning Publishers, 2013. 3. Kimberly Graves, “CEH Official Certified Ethical Hacker Review Guide”, Wiley Publishers, 2007. 4. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015. 5. Georgia Weidman, “Penetration Testing: A Hands-On Introduction to Hacking”, No Starch Press, 2014.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	-	-	-	-	-	-	2	2	2
CO2	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO3	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO4	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO5	2	2	2	2	2	2	-	-	-	-	-	-	2	2	2
Avg	2	2	2	2	2	2	-	-	-	-	-	-	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 725	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	RISK MANAGEMENT IN BANKS	Minor
Course Objectives:		
<ol style="list-style-type: none"> To understand the basic concept of risk management in banks. To expose the various types of risk faced by banks. 		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. Understand and appreciate the concepts of Risk/ Return Trade-offs.</p> <p>CO2. Explore the knowledge required for Credit Risk Management</p> <p>CO3. Analyse and identify the various operational risks for banks.</p> <p>CO4. Explain the different kinds of market risks.</p> <p>CO5. Demonstrate the various Risk measurement and controlling strategies</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: INTRODUCTION		9 Hrs
Risk definition – Basel Committee Norms – Risk Process- Risk Organization and policy – Important risks in commercial banks – Regulatory Framework and RBI guidelines - Liquidity Risk Management and Asset Liability Management.		
Unit II: CREDIT RISK		9 Hrs
Credit risk framework - RBI guidelines - Risk rating and risk pricing - Credit risk assessment - Standardized approach and Advanced approach - Credit rating /scoring - Credit Bureaus - Stress test and sensitivity analysis - Internal Capital Adequacy Assessment Process (ICAAP) - Structured products.		
Unit III: OPERATIONAL RISK		9 Hrs
Operational risk framework - Types of operational risk - Causes for operational risk - Sound Principles of Operational Risk Management (SPOR) - Identification, measurement, control / mitigation of operational risks- Organizational set up and Policy requirements- Strategic approach and key responsibilities of ORM - Capital allocation for operational risk, methodology and qualifying criteria for banks for the adoption of the methods; Computation of capital charge for operational risk.		
Unit IV: MARKET RISK		9 Hrs
Interest rate risk - Price risk (Equity) - Commodity risk - Currency risk – Managing Market risk - Measuring Market risk under Basel- Standardized duration method- Internal measurement approach – Value at Risk (VaR) – Equity Risk Premium (ERP)		
Unit V: RISK MEASUREMENT, CONTROL AND MANAGEMENT		9 Hrs
Risk Calculation - Risk exposure analysis - Prudential norms – Income Recognition and Asset Classification (IRAC) norms -Capital adequacy norms - Hedging – Forwards – Futures – Options Arbitrage opportunities -Regulatory prescriptions of risk management - Systems Audit - Risk Organization and Policy.		
Text Books:		
<ol style="list-style-type: none"> Moorad Choudhry, Bank Asset and Liability Management: Strategy, Trading, Analysis, Wiley Publishing. John C. Hull, Risk Management and Financial Institutions , Pearson. Indian Institute of Banking and Finance(IIBF), Risk Management , Macmillan Publishers India. IIBF., Risk Measurement Models to Capital Allocation Policies, Wiley. Foundations of Banking Risk: An Overview of Banking, Banking Risks and Risk-Based Banking Regulation by GARP (Global Association of Risk Professionals). 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	2	2	-	-	-	-	2	2	2	2
CO2	3	2	-	-	-	2	2	-	-	-	-	2	2	2	2
CO3	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
CO4	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	2	2	-	-	-	-	2	3	3	3
Avg	2.8	2	-	-	-	2	2	-	-	-	-	2	2.6	2.6	2.6

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 726	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	PRUDENTIAL MANAGEMENT FOR BANKER	Minor
Course Objectives:		
<ol style="list-style-type: none"> To understand the basic concept of prudential management in banks To expose the various regulatory framework and guidelines for banks in India 		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. Understand the various prudential banking practices in India.</p> <p>CO2. Explore the required knowledge on credit appraisal</p> <p>CO3. Demonstrate skill sets to apply the prudential norms.</p> <p>CO4. Analyse the capital adequacy for banks.</p> <p>CO5. Explain the various exposure norms.</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: INTRODUCTION		9 Hrs
Basel Committee - RBI Good Governance Policies and Practices - Risk Management Process in Banks - Risk Organization and policy – Important risks in commercial banks – Regulatory Framework and RBI guidelines – Bank risk management policy – Risk Management Committee – Role of Board of Directors.		
Unit II: ASSET LIABILITY MANAGEMENT IN BANKS		9 Hrs
Bank balance sheet – Financial margin – Liquidity and Interest rate risk – Interest rate sensitivity - ALM Information System – ALM organization and ALM process, risk parameter, identification, measurement, management and tolerance levels.		
Unit III: ASSET QUALITY		9 Hrs
Credit Appraisal and Loan Pricing - Income Recognition and Asset Classification and Provisioning norms – RBI guidelines – Role of Board of Directors and RBI guidelines – NPA Management – Recovery policies and strategies of Banks – Modes of Recovery - Role of Asset Reconstruction Companies.		
Unit IV: CAPITAL ADEQUACY		9 Hrs
Basel Committee Norms for Capital Adequacy - RBI norms for capital adequacy – Regulatory capital – Capital charge for credit risk and market risk – Calculation of total risk weighted assets to capital ratio – Risk weights for credit risk – Off balance sheet items - Reporting requirements and actions.		
Unit V: EXPOSURE NORMS		9 Hrs
Exposure Norms for Credit – Single and group borrowers – exposure for various products – consortium arrangements – types of exposure and prudential limits – Emerging trends in prudential norms – Case studies.		
Text Books:		
<ol style="list-style-type: none"> Sant, R.K., Managing Non Performing Assets by Public Sector Banks. Ramachandra Reddy B., Management Of Non-Performing Assets In Banks And Financial Institutions. Srivastava Ashish, Effectiveness of Prudential Regulations for Banks: Global Perspective and Indian Context, Eliva Press. Mathias Dewatripont, The Prudential Regulation of Banks, The MIT Press. IFSCA, The IFSCA Banking Handbook: Prudential Directions. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 727	Subject Title	L T P C 3 0 0 3
Cognitive	SUSTAINABLE FINANCE	Minor
Course Objectives:		
<ol style="list-style-type: none"> To provide basic principles for managing Sustainable Finance To create a forum of shared learning for managers. 		
Course Outcomes:		
<p>On completion of the course, the students will able to:</p> <p>CO1. Do investment in Green Finance products.</p> <p>CO2. Gain exposure to this emerging and exciting field.</p> <p>CO3. Understand the challenges and opportunities around sustainable finance.</p> <p>CO4. Choose the career in the field of Sustainable Finance</p> <p>CO5. Explain the concepts of ESG.</p>		
Pedagogy: Lectures, Assignment, presentations		
Unit I: INTRODUCTION		9 Hrs
Introduction to Climate Change - Sustainable Development - Sustainability and Finance - Introduction to sustainable finance - Economics of transitioning to a lower carbon future – costs, past trends, emerging opportunities stranded assets - Opportunities and challenges in financing green assets – the role of markets, regulations, and technology - Pricing carbon, using carbon finance and carbon markets - Emerging emissions trading schemes across the world.		
Unit II: RISK ASSESSMENT		9 Hrs
Risk assessment due to climate change – sub-regionally and sectorally - Climate risk disclosure for mitigation and adaptation - Risk mitigation in financing green projects and companies, including examples of how risks were mitigated.		
Unit III: GREEN INVESTMENT		9 Hrs
Green bonds – an introduction and updates on latest developments - The involvement of stock exchanges – how stock exchanges can grow green finance and the development of “green finance hubs” - Understanding Thematic Bonds		
Unit IV: GREEN ASSETS MANAGEMENT		9 Hrs
Development Finance Institutions and Blended Finance - Banking and sustainable asset management - Insurance and climate vulnerability – climate risks mitigation through the insurance sector		
Unit V: ESG & INTERNATIONAL DEVELOPMENTS		9 Hrs
Concept of ESG - International Governance for Climate Change - Climate Finance Opportunity for Financial Institutions (Global) - International developments in UNFCCC negotiations on climate finance and other international developments.		
Text Books:		
<ol style="list-style-type: none"> Dirk Schoemaker, Willem Schramade, “Principles of Sustainable Finance”, OUP Oxford publishers Handbook of Environmental and Sustainable Finance, Science Direct Simon Thompson, Green and Sustainable Finance: Principles and Practice, Kogan Page publisher 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	1	2	2	3	3	3	3	3	2
CO2	3	3	3	2	1	2	1	3	2	3	3	3	3	3	2
CO3	3	3	3	2	2	2	2	3	2	3	3	3	3	3	2
CO4	3	3	3	2	2	2	2	3	2	3	3	3	3	3	2
CO5	3	3	3	2	2	2	2	3	2	3	3	3	3	3	2
Avg	3	3	3	2	1.6	2	1.6	2.8	2	3	3	3	3	3	2

S-Strong (3)

M- Medium (2)

L- Low (1)

Subject Code BTCB 728	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	STARTUP FINANCING	Minor
Course Objectives:		
1. To understand new venture creation opportunities, its resources. 3. To understand the key elements of a successful start-up, competition and the product/service.		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Explore the requirements for Enterprise Start-up. CO2. Gain exposure to this emerging and exciting field of start-up financing. CO3. Understand the key issues in entrepreneurial and venture finance CO4. Choose the career in the field of Entrepreneur ship. CO5. Explain the impact in an international context.		
Pedagogy: Lectures, Assignment, presentations		
Unit I: BUSINESS EVALUATION		9 Hrs
Valuate early stage business opportunity - Generate Ideas with Brainstorming- Business Start-up - Ideation- Venture Choices - Standard tools of valuation - The Rise of The start-up Economy - - The Entrepreneurial Ecosystem – Entrepreneurship in India - Government Initiatives.		
Unit II: FINANCING		9 Hrs
start-up capital Resource requirements - estimating Start-up cash requirements - Develop financial assumptions – start-up funding stages - start-ups financing metrics - Feasibility Analysis - The cost and process of raising capital – - Funding with Equity – Funding with Debt- lease financing - Funding start-ups with boots trapping- crowd funding- strategic alliances - External Commercial Borrowing – Angel investors – Venture capital funding - Unique funding issues of a high-tech ventures		
Unit III: INSTITUTIONAL FINANCIAL SUPPORT		9 Hrs
Schemes for providing finance by developmental financial institutions - Small Scale Industries Development Corporations (SSIDCs) - District Industries Centers (DICs) – Industrial Development Corporation (IDC) - State Financial Corporation (SFCs) - Technical Consultancy Organisation (TCO) - Small Industries Service Institute (SISI) – National Small Industries Corporation (NSIC) - Small Industries Development Bank of India (SIDBI).		
Unit IV: STARTUP SURVIVAL AND GROWTH		9 Hrs
Stages of growth in a new venture- Growing with the market - Growing within the industry - Start-up Culture - Various measures of encouragement and support being provided by the State and Central Government for strengthening the Entrepreneurial Culture - Reasons for new venture failures- Scaling Ventures - preparing for change – Leadership succession.		
Unit V: EXIT OPTIONS		9 Hrs
Dealing with Failure: Bankruptcy, Exit Strategies - Selling the business - Cashing out but staying in-being acquired- Going Public (IPO) – Liquidation.		
Text Books:		
1. Levin, Jack S., Structuring Venture Capital, Private Equity, and Entrepreneurial Transactions, Aspen Publishers. 2. Nicolaj Hojer Nielsen, The start-up Funding: New Ventures, APS publishers. 3. Kathleen R Allen, Launching New Ventures: An Entrepreneurial Approach, Cengage Learning. 4. Steven Fisher, Janae’ Duane, The start-up Equation -A Visual Guidebook for Building Your start-up, Mc. Graw Hill Education.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		3								2			2	3	
CO3		3	3	2	3				2		2		3	3	
CO4		3	3	3	2						3	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	3	3	2.7	2.5	-	3	3	2	2	2.7	2.5	2.7	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 730	Subject Title	L T P C 3 0 0 3
<i>Cognitive</i>	DECENTRALIZED FINANCE (De Fi)	Minor
Course Objectives:		
1. To introduce the fundamental concepts of DeFi 2. To Understand the DeFi tools		
Course Outcomes:		
On completion of the course, the students will able to: CO1. Understand the concepts of basics of DeFi. CO2. Acquire the required knowledge in various DeFi tools. CO3. Apply the DeFi tools for application in Smart Contract. CO4. Analyze the importance of decentralized lending and borrowing. CO5. Explore the challenges and risks for DeFi..		
Pedagogy: Lectures, Assignment, presentations		
Unit I: INTRODUCTION TO TRADITIONAL FINANCE		9 Hrs
Traditional Finance – Money in the Economy-Money Creation-Trade Execution in financial markets-Market Microstructure-Role of Central Banks- Role of Financial Institutions- Broad and Narrow money-monetary Policy.		
Unit II: OVERVIEW OF DeFi		9 Hrs
Definition of DeFi - The history of DeFi - Advantages and disadvantages of DeFi- Understanding the role of decentralized technologies in DeFi - CeFi vs. DeFi — Comparing Centralized to Decentralized Finance- Blockchain-and-Smart Contract-Based Financial Markets.		
Unit III: INTRODUCTION TO SMART CONTRACTS		9 Hrs
Smart Contracts- Cryptocurrency and Privacy Law- Formalizing and Securing- Decentralized Identities-Proof of Person-Privacy in Contract -Relationships on Public Networks- decentralized governance-Overview of popular DeFi-DAOs		
Unit IV: DECENTRALIZED LENDING AND BORROWING		9 Hrs
Introduction to decentralized lending and borrowing platforms - Advantages and disadvantages of decentralized lending and borrowing- Overview of popular DeFi lending and borrowing platforms-DeFi Protocols for Loanable Funds - The Decentralized Financial Crisis.		
Unit V: RISKS AND CHALLENGES IN DEFI		9 Hrs
Predictions for the future of DeFi- Challenges and opportunities for DeFi growth- Implications of DeFi for the broader financial industry- Risk Management - Smart contract risk- Liquidity risk- Operational risk- Social and reputational risk.		
Text Books:		
1. Birrer, Thomas K. Dennis Amstutz, and Patrick Wenger, Decentralized Finance: From Core Concepts to DeFi Protocols for Financial Transactions , Springer. 2. Nakamoto Satoshi, DECENTRALIZED FINANCE (DeFi)-Alternative to Central Banking for the Future of Finance: How to Trade-Borrow-Lend-Save-Invest in Cryptocurrency Peer to Peer (P2P), Yield Farming, Investing for Beginners , Kindle. 3. Harvey, Campbell R, Ashwin Ramachandran, and Joey Santoro, DeFi and the Future of Finance , John Wiley Sons. 4. Blinder, Alan S, Central Banking in Theory and Practice , Mit press. 5. Voshmgir, Shermin, Token Economy: How the Web3 Reinvents the Internet , Token Kitchen.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	2	-	-	2	2	2	2	2	3	3
CO2	3	3	3	3	2	2	1	2	2	1	1	3	2	3	3
CO3	2	3	3	3	3	1	3	2	3	3	3	3	3	3	3
CO4	1	2	2	2	3	2	3	3	3	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	2	3	3	3	3	3	3
Avg	2.4	2.8	2.4	2.8	2.8	2	2.3	2.3	2.4	2.2	2.2	2.6	2.6	3	3

S-Strong (3)

M- Medium (2)

L- Low (1)

OPEN ELECTIVE / MULTIDISCIPLINARY COURSES OFFERED UNDER NEP 2020

COURSE CODE	LIST OF COURSE	L-T-P-C
BTCB 731	Financial Technology and Development	3-0-0-3
BTCB 732	Banking Technology and Development	3-0-0-3
BTCB 733	Introduction to Cyber Security and IT Laws	3-0-0-3
BTCB 734	Introduction to Financial System and Banking	3-0-0-3
BTCB 735	Design Thinking and Creativity	3-0-0-3
BTCB 736	Ecosystem for Fintech	3-0-0-3

Note: Open Elective Courses are offered to the students of other Departments.

Subject Code BTCB 731	Subject title FINANCIAL MANAGEMENT AND DEVELOPMENT	L T P C 3 0 0 3
Course Objectives: 1. To learn the various Financial Payments, digital and alternative finance. 2. To expose the various regulators for Fintech and Data privacy regulations.		
Course Outcomes: On completion of the course the students will be able to: CO1. Understand about the Fintech evolution and current status. CO2. Interpret practical knowledge of Fintech payment methods. CO3. Implement the various digital and alternative finance methods. CO4. Examine the regulations and its ecosystem for Fintech Institutions. CO5. Demonstrate about the Data and privacy regulation.		
Pedagogy: Lecture, Assignment and Presentation		
Unit I: FinTech Introduction Transformation – FinTech Evolution: Infrastructure, Banks Start-ups and Emerging Markets - Collaboration between Financial Institutions and Start-ups –FinTech Typology – Emerging Economics: Opportunities and Challenges - 8 From too-Small-To-Care to Too-Big-To-Fail – Introduction to Regulation Industry - The Future of RegTech and other Technologies Impacting it.		9 Hrs
Unit II: Payments Payments, Crypto currencies and Blockchain – Introduction - Individual Payments –Digital Financial Services – Mobile Money – Regulation of Mobile Money – SFMS - RTGS - NEFT –NDS Systems – Crypto currencies – Legal and Regulatory Implications of Crypto currencies – Blockchain – The Benefits from New Payment Stacks.		9 Hrs
Unit III: Digital Finance and Alternative Finance Financial Innovation – Digitization of Financial Services - FinTech & Funds- Crowd funding– Regards, Charity and Equity - P2P and Marketplace Lending – New Models and New Products – ICO.		9 Hrs
Unit IV: FinTech Regulation and RegTech FinTech Regulations Evolution of RegTech – RegTech Ecosystem: Financial Institutions – RegTech Ecosystem Ensuring Compliance from the Start: Suitability and Funds – RegTech Start-ups: Challenges – RegTech Ecosystem: Regulators Industry – Use Case of AI in Smart Regulation and Fraud Detection – Regulatory Sandboxes – Smart Regulation – Redesigning Better Financial Infrastructure.		9 Hrs
Unit V: Data & Tech Data Regulation – Data in Financial Services –Application of Data Analytics in Finance - Methods of Data Protection: GDPR Compliance and Personal Privacy – How AI is Transforming the Future of FinTech – Digital Identity – Change in mindset: Regulation 1.0 to 2.0 (KYC to KYD) - AI & Governance – New Challenges of AI and Machine Learning - Challenges of Data Regulation - Data is the New Oil: Risk of Breach – The Future of Data-Driven Finance - Case Studies.		9 Hrs
Text and Reference Books: 1. Agustin Rubini, Fintech in a Flash: Financial Technology Made Easy, Zaccheus, 3rd Edition, 2018 2. Susanne Chishti and Janos Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, John Wiley, 1st Edition, 2016.		

3. Theo Lynn, John G. Mooney, Pierangelo Rosati, Mark Cummins, *Disrupting Finance: FinTech and Strategy in the 21st Century*, Palgrave, 1st edition, 2018
4. Abdul Rafay, *FinTech as a Disruptive Technology for Financial Institutions*, IGI Global, January, 2019.
5. Bernardo Nicoletti, *The Future of FinTech: Integrating Finance and Technology in Financial Services*, Palgrave Macmillan, August, 2018

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	-	-	-	-	-	1	2	2	2	2
CO2	2	3	2	3	3	2	-	-	-	-	3	2	3	3	3
CO3	2	3	2	3	3	2	-	-	-	-	3	2	2	3	3
CO4	2	3	2	3	3	2	-	-	-	-	3	2	3	3	3
CO5	2	3	2	3	3	2	-	-	-	-	3	2	3	2	2
Avg	2	2.6	2	2.6	2.6	2	-	-	-	-	2.6	2	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 732	Subject title BANKING TECHNOLOGY AND DEVELOPMENT	L T P C 3 0 0 3
Course Objectives: 1. To introduce the concept of Core Banking and the Technologies involved in it. 2. To explore Banking Channels, Payments gateways and settlement systems.		
Course Outcomes: On completion of the course the students will be able to: CO1. Understand the components of CBS. CO2. Interpret practical knowledge of Digital Banking channels. CO3. Implement the various payment and settlement systems used in Banking and its uses. CO4. Examine the risks associated with banking operations at back-end. CO5. Demonstrate about the modern delivery channels.		
Pedagogy: Lecture, Assignment and Presentation		
UNIT I: Branch Operation and Core Banking Introduction and Evolution of Bank Management- Reports - Technological Impact in Banking Operations– Total Branch Computerization – CBS– Concept, Opportunities .– Uses of CBS India – across the globe – A case study of recent CBS, e.g., BaNCs, Finacle, etc. – CBS components and its functionalities - Network architecture – ATM- data transfer interface –security architecture – Analysis of current CBS.		9 Hrs
UNIT 2: Digital Banking Channel Background – Business Models – Technology Models - Overview of delivery channels – Automated Teller Machine (ATM) – Phone Banking –Call centers – Internet Banking – Mobile Banking- micro ATM. Digital Wallets – Bank Wallets – Private Wallets Payment Gateways. Other Digital Payment Systems -Electoral bond – e-money, e-wallets, e-cheques -Crypto-currencies.		9 Hrs
UNIT 3: Payment and Settlement Systems Payment Systems Interbank Payment Systems – INFINET and NPCINet - Interface with Payment system Network– SWIFT- Structured Financial Messaging system (SFMS) - NEFT – RTGS; National Payments Corporation of India (NPCI) – Functions & Products – NFS - UPI – BHIM – NACH – IMPS - *99# – NETC – AEPS – BBPS - Bharat QR Code - Card technologies (RuPay), e-RUPI, CTS and Settlement Process.		9 Hrs
UNIT 4: Digital Banking – Back-office operations Data management – Risk management – Security and privacy of Information management – Treasury management system - asset and liability management system, and Forex management system.		9 Hrs
UNIT 5: Other Developments Modern Delivery Channels – Drone-based payments -Open Banking models – Neo banking Models - Virtual banking models - Security aspects of digital banking systems – Revolution of Banking systems using modern technologies– Smart Payment system models.		9 Hrs
Text and Reference Books: 1. Kaptan SS & Choubey N S., E-Indian Banking in Electronic Era, Sarup & Sons, New Delhi, 2013. 2. Vasudeva, E–Banking, Commonwealth Publishers, New Delhi, 2010 3. Banking Technology – Indian Institute of Bankers Publication,2010 4. SengLoke, Auerbach, Context-Aware Pervasive Systems: Architectures for a New Breed of Applications, 2013		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1	-	-	-	-	-	1	2	2	2	2
CO2	2	3	2	3	3	3	-	-	-	-	3	2	3	2	2
CO3	2	3	2	3	3	3	-	-	-	-	3	2	2	3	3
CO4	2	3	2	3	3	3	-	-	-	-	3	2	3	3	3
CO5	2	3	2	3	3	1	-	-	-	-	3	2	3	3	3
Avg	2	2.8	2	2.6	2.6	2	-	-	-	-	2.6	2	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 733	Subject title INTRODUCTION TO CYBER SECURITY AND IT LAWS	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To understand the importance of cyber security in banks To understand the basics of security of financial assets 		
<p>Learning Outcome:</p> <p>CO1. Interpret and understand the various cybercrimes. CO2. Elucidate the various cyber frauds and attacks. CO3. Explore the need and use of cyber forensic tools. CO4. Apply preventive security controls and cryptographic techniques based on crime identified. CO5. Analyze and identify the IT Laws for cyber security attacks.</p>		
<p>Pedagogy: Lecture, Assignment and Presentation</p>		
<p>Unit I: INTRODUCTION TO CYBER CRIME</p>		<p>9 Hrs</p>
<p>Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes</p>		
<p>Unit II: ATTACKS AND COUNTERMEASURES</p>		<p>9 Hrs</p>
<p>OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.</p>		
<p>Unit III: INTRUSION DETECTION</p>		<p>9 Hrs</p>
<p>Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.</p>		
<p>Unit IV: INTRUSION PREVENTION</p>		<p>9 Hrs</p>
<p>Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.</p>		
<p>Unit V: Laws for Cyber Security</p>		<p>9 Hrs</p>
<p>A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment. Civil and criminal liability of cybercrime - Challenges of legislative, law enforcement and justice system – Indian and International Initiatives.</p>		
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, NotionPress, 2021. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning Publishers, 2013. Kimberly Graves, “CEH Official Certified Ethical Hacker Review Guide”, Wiley Publishers,2007. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015. Georgia Weidman, “Penetration Testing: A Hands-On Introduction to Hacking”, No Starch Press, 2014. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	-	-	-	-	-	-	2	2	2
CO2	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO3	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO4	2	2	2	2	2	2	-	-	-	-	-	-	3	3	3
CO5	2	2	2	2	2	2	-	-	-	-	-	-	2	2	2
Avg	2	2	2	2	2	2	-	-	-	-	-	-	2.6	2.6	2.6

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 734	Subject title INTRODUCTION TO FINANCIAL SYSTEM AND BANKING	L T P C 3 0 0 3
Course Objectives <ol style="list-style-type: none"> To introduce concepts and theories related to Financial System in India To facilitate the application of the concepts and theories into practice in the field of BFSI sectors 		
Course Outcome: On completion of the course, the students will able to: CO1. Understand and appreciate the concepts of Financial Institution, markets and services. CO2. Enrich their knowledge on key areas of financial products and services. CO3. Acquire required knowledge and demonstrate skills sets required for BFSI sectors. CO4. Elucidate the various Financial markets in India. CO5. Enhance the recent trends in Financial services.		
Pedagogy: Lecture, Discussion, Case studies, Presentation, Role plays.		
Unit I: Introduction Financial Sector Reforms - Monetary Policy - Instruments and its role in economy - Structure of Financial System – Financial Market Instruments and Institutions - Money Market Vs. Capital Market – Primary and Secondary Securities - Innovative Instruments - Financial Services – Fund Vs. Fee based services - Mutual Funds.		9 Hrs
Unit II: Capital Markets and Instruments Functions and Structure - Primary and Secondary market - Mechanism-instruments and financing - Regulatory Framework- SEBI Regulations - Stock Exchanges - Bond Market - Debt Market in India - Government Securities- Corporate Bond Market - Recent Developments - Derivatives Market – Currency and Commodity markets.		9 Hrs
Unit III: Indian Banking System Banking pre and post-independence – Banking and Non-banking institutions - Commercial Banking and its classification – RRBs and Cooperative Banks - Small Finance Banks and Payment Banks - Credit creation and deployment by banks - Development Banking – Investment banking – Merchant banking - Lead Bank.		9 Hrs
Unit IV: Retail Banking Functions of Banks- Corporate Vs Retail banking - Deposits and Loans - Account Opening and types of customers – Banker customer relationship - KYC Procedures - Major Developments - Financial Inclusion and SHGs – Financial Innovations - Factoring, Securitization, bancassurance, Consortium Financing – Role of technology and its impact on retail banking.		9 Hrs
Unit V: Regulatory Environment for banks and financial institutions Central Banking Authority and Credit control - RBI – SEBI, IRDA and NABARD. – Regulatory provisions governing banks - RBI Act, 1934 – FEMA 1999, Banking Regulations Act 1949 – Bankers Book of Evidence Act 1879 – PMLA Act 2002 – IT Act 2000.		9 Hrs
Text Book and Reference Books: <ol style="list-style-type: none"> IIBF, Principles and Practices of Banking, 3rd Edition, MacMillan Education. IIBF, Legal and Regulatory Aspects of Banking, 3rd Edition, MacMillan Education. Khan.M.Y, Indian Financial System, McGraw Hill Education Pvt. Ltd, 9th Edition, Preethi Singh, Dynamics of the Indian Financial system: Markets, Institutions and Services, Ane Books. Nitynanada Sharma.V, Banking and Financial System, Cambridge University Press.. 		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		1		2	1		1	2	1	1		2	1
CO2	3	2		1		2	1		1	2	1	1		2	1
CO3	3	3		2		2	2		2	3	2	2	2	2	3
CO4	3	3		2		2	2		2	3	2	2	2	2	3
CO5	3	3		2		2	2		2	3	2	2	2	2	3
Avg	3	2.6		1.6		2	1.6		1.6	2.6	1.6	1.6	2	2	2.2

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 735	Subject title DESIGN THINKING AND CREATIVITY	L T P C 3 0 0 3
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. To explain the concept of design thinking for product and service development 2. To describe the fundamental concept of innovation and design thinking 		
<p>Course Outcome:</p> <p>On completion of the course, the students will be able to</p> <p>CO1. To compare and classify the various learning styles and memory techniques and apply them in their engineering education.</p> <p>CO2. To analyze emotional experience and inspect emotional expressions to better understand users while designing innovative products.</p> <p>CO3. To develop new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products.</p> <p>CO4. To explore real-time innovative engineering product designs and choose appropriate frameworks, strategies, techniques during prototype development.</p> <p>CO5. To perceive individual differences, its impact on everyday decisions and create a better customer experience.</p>		
<p>Pedagogy: Lecture, Discussion, Case studies, Presentation, Role plays.</p>		
<p>Unit I: Identifying Customer Needs and Product Specifications</p>		<p>9 Hrs</p>
<p>Design thinking - EDIPT (Empathy, Define, Ideate, Prototype and Test) - Understand the critical design thinking skills needed to either improve an existing product or design a new product - Identify customer needs and draft customer needs statements - translate user needs into product specifications quantitatively, and how establishing product metrics can help to define those specifications - Tools for Design Thinking</p>		
<p>Unit II: Creativity and Prototyping</p>		<p>9 Hrs</p>
<p>Apply creativity, brainstorming, and concept generation process in designing needs solutions - Explore prototyping methods, strategies -Real-life examples to create a design that represents customer needs and product specifications.</p>		
<p>Unit III: Design for Services and Architecture</p>		<p>9 Hrs</p>
<p>Design of services, identify the potential for innovations within them - apply product development frameworks to the service context - perform financial analysis of project idea and decide if it is backed by a strong business rationale (Worth-It) - design for environment principles to a product life cycle.</p>		
<p>Unit IV: Product Development Process</p>		<p>9 Hrs</p>
<p>Select and implement a product development process (STAGED, SPIRAL, AND AGILE) aligned to the project needs.</p>		
<p>Unit V: Design Thinking for strategic innovations</p>		<p>9 Hrs</p>
<p>Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Martin, Roger L.. The Design of Business: Why Design Thinking is the Next Competitive Advantage. United States: Harvard Business Press, 2009. 2. Mootee, Idris. Design Thinking for Strategic Innovation: What They Can't Teach You at Business Or Design School. Germany: Wiley, 2013. 3. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, Engineering Design: An Introduction. 		

United States: Cengage Learning, 2012.

Liedtka, Jeanne., King, Andrew Courtland., Bennett, Kevin Bruce., Bennett, Kevin. Solving Problems with Design Thinking: 10 Stories of what Works. United Kingdom: Columbia University Press, 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											3		
CO2		3	2							2			3	2	
CO3		3	3	2	3				2		2		2	3	
CO4		3	3	3	2		2				2	3		3	3
CO5		3	3	3			3	3			3	2			3
Avg	3	2.8	2.8	2.7	2.5	-	2.5	3	2	2	2.3	2.5	2.7	2.7	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Subject Code BTCB 736	Subject title ECOSYSTEM FOR FINTECH	L T P C 3 0 0 3
Course Objectives 1. To understand the key technologies and trends driving innovation in the FinTech. 2. To understand regulatory frameworks for FinTech.		
Course Outcome: On completion of the course, the students will be able to CO1. Demonstrate a comprehensive understanding of the key technologies and trends CO2. Drive innovation in the FinTech industry CO3. Apply various technologies for FinTech products and services. CO4. Evaluate the regulatory frameworks that apply to FinTech. CO5. Analyse the various developments and ethical requirements for FinTech.		
Pedagogy: Lecture, Discussion, Case studies, Presentation.		
Unit I: Introduction to FinTech The history of FinTech and its evolution over time- Changing Payment Landscape- Defining FinTech and its impact on the financial industry- FinTech products and services- FinTech and its key characteristics - The role of technology and innovation in the FinTech		9 Hrs
Unit II: The FinTech Ecosystem Various players in the FinTech ecosystem- roles and responsibilities of each player in the FinTech ecosystem- The importance of collaboration and partnerships in the FinTech ecosystem- Types of FinTech products and services- The benefits of FinTech products-Challenges of FinTech		9 Hrs
Unit III: FinTech Infrastructure Blockchain- cryptocurrencies and digital identity-Artificial Intelligence (AI)- How AI is used in FinTech, including in fraud detection and risk management- Cloud Computing in FinTech - Data in FinTech- Data in FinTech-Payment Systems- various players involved in payment systems		9 Hrs
Unit IV: FinTech Regulatory System The role of regulators in overseeing the FinTech industry- The various regulatory frameworks- Regulations regarding banking, securities, and consumer protection- Role of Central Banks- Securities Regulation in FinTech- Global Regulatory Trends in FinTech		9 Hrs
Unit V: FinTech Around the World The state of the FinTech industry- The key players and subsectors of FinTech markets, including mobile banking, remittances, and microfinance- The regulatory and market conditions for the development of FinTech-Ethical and social considerations related to financial inclusion, data privacy, and social impact.		9 Hrs
Text Books: 1. Gupta, Pranay, and T. Mandy Tham. Fintech: the new DNA of financial services. Walter de Gruyter GmbH & Co KG, 2018. 2. Bril, Herman, Georg Kell, and Andreas Rasche, eds. Sustainability, technology, and finance: Rethinking how markets integrate ESG. Taylor & Francis, 2022. 3. Amalia, Fitri. The fintech book: The financial technology handbook for investors, entrepreneurs and visionaries. Journal of Indonesian Economy and Business: JIEB. 31, no. 3 (2016). 4. Mention, Anne-laure, and Dimitrios G. Salampasis, eds. Transformation Dynamics in FinTech: An Open Innovation Ecosystem Outlook. Vol. 7. World Scientific, 2021. 5. Shrier, David L., and Alex Pentland, eds. Global Fintech: Financial Innovation in the Connected World. MIT Press, 2022.		

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	1	2	3	3	3	3	3	2	2	3	3
CO2	2	3	-	1	-	1	1	-	1	1	1	-	2	3	2
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	2	3
CO4	2	3	2	2	2	2	1	2	2	2	2	2	2	2	1
CO5	3	3	3	3	3	3	3	3	3	3	2	3	3	2	2
Avg	2.2	3	2.5	2	2	2.2	2	2.5	2.2	2.4	2	2.25	2.4	2.4	2.2

S-Strong (3)

M-Medium (2)

L-Low (1)