



PONDICHERRY UNIVERSITY, PONDICHERRY

(A Central University)

SCHOOL OF MANAGEMENT

DEPARTMENT OF BANKING TECHNOLOGY

Curriculum & Syllabus

Five Year Integrated B.Tech (CSBS)., M.B.A (BT/FT)

**B.Tech., (Computer Science and Business Systems), M.B.A.,
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), and
- ❖ Ph.D. in Computer Science and Engineering (Banking Technology)*
- ❖ Five Year Integrated B.Tech (CSBS), M.B.A., in Banking Technology / Financial Technology *

(*Department BoS and School Board Approved)

Five Year integrated B.Tech (Computer Science & Business Systems),, MBA (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.

Note: At present, there is no clear guidelines, neither from AICTE nor from Pondicherry University for NEP programmes come under AICTE. Hence, this programme is designed based on the existing UGC guidelines for NEP programmes and will be modified suitably as per AICTE-NEP guidelines, as soon as it is available.

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

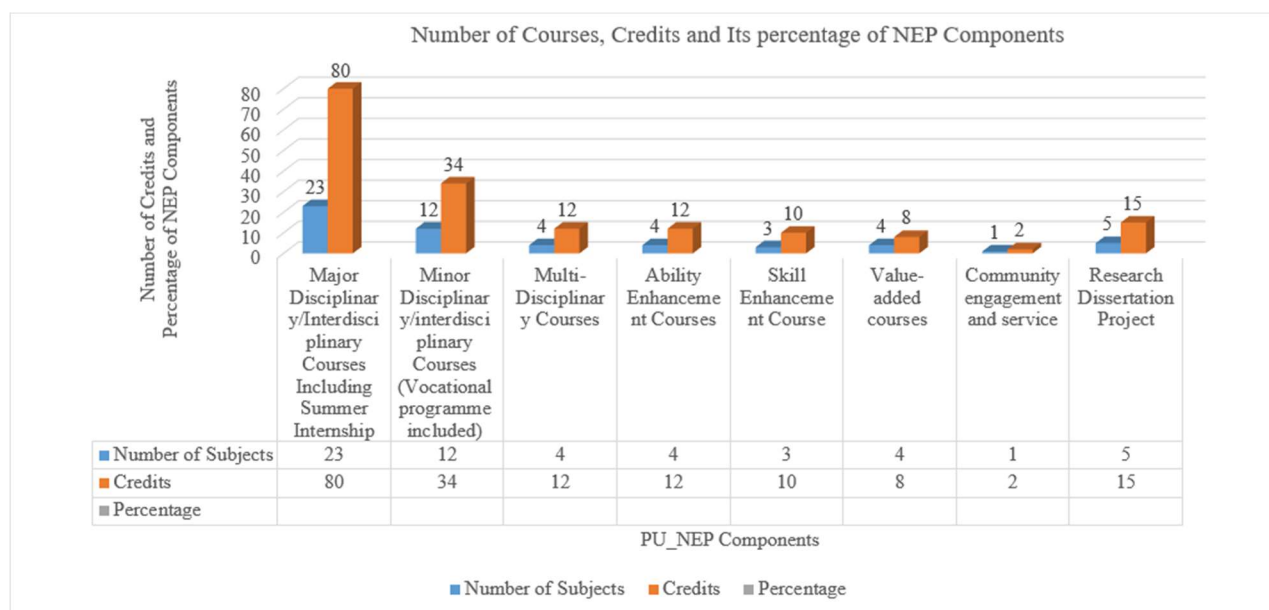
The students have the option to exit in the 4th Year with BTech in Computer Science and Business Systems. If they would like to continue then, after 4th year, Students will be drawn for MBA-BT and MBA-FT, 30 students each programme, based on CGPA.

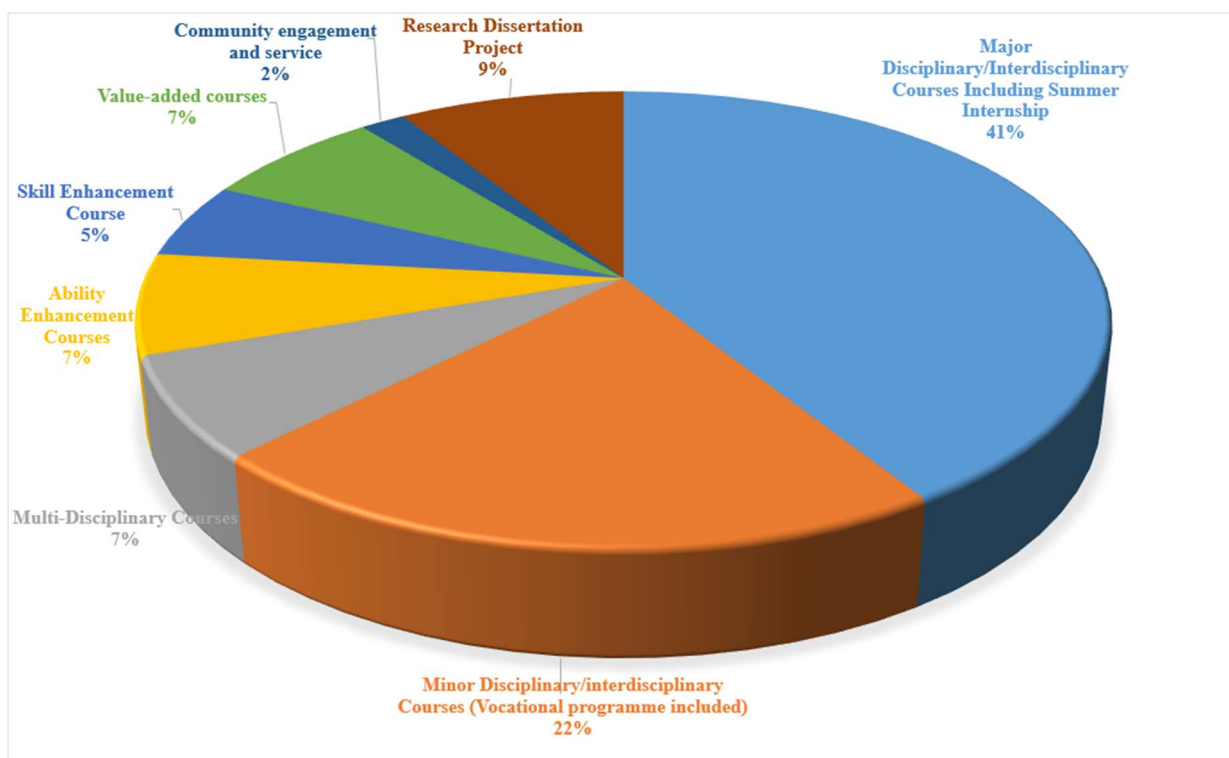
Admission Procedure:

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.

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.





Attendance:

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

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 guidelines 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 60 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 (Either or Pattern) each carrying six (06) marks (Two questions should be asked from each unit) (**5*6=30 marks**) and PART- C with a compulsory question consisting a case study/ problem in the relevant subject (**1*10=10 marks**)

Suitable amendments will be made based 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: Five Year Integrated B.Tech(CSBS)., MBA(BT/FT)

*B.Tech (CSBS - Computer Science and Business System).,
MBA (BT-Banking Technology / FT-Financial Technology)*

*Title at the end of 5th year: MBA (Banking Technology) / MBA (Financial
Technology)*

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

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

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

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

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.,

PONDICHERRY UNIVERSITY, PUDUCHERRY

(A Central University)

SCHOOL OF MANAGEMENT

DEPARTMENT OF BANKING TECHNOLOGY

Curriculum 2024-2029 for 5 Year Integrated B.Tech (CSBS), M.B.A (BT/FT)

B.Tech., (Computer Science and Business Systems) M.B.A., Banking Technology/Financial Technology

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)

- ❖ Apply the knowledge of mathematics and science in engineering to solve complex engineering problems.
- ❖ Having the ability to design a component or a product by applying all the relevant standards and with realistic constraints.
- ❖ Use research-based knowledge and methods, including statistical tools, analysis, interpretation and synthesis, to provide valid conclusions.
- ❖ Function effectively as an individual and a member/leader in diverse teams and multidisciplinary settings.
- ❖ Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work as a team member and leader to manage projects in multidisciplinary environments.
- ❖ Recognize the need for and have the preparation and ability to engage in independent and lifelong 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.



PONDICHERY UNIVERSITY, PONDICHERY

(A Central University)

Curriculum- 2024-2029 for

5 Years Integrated B.Tech, M.B.A (CSBS & BT/FT)

SEMESTER I

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MDC	NS-1	Mathematics I -Fundamentals of Mathematics	3-0-0-3
	SS - 1	Fundamentals of Business Systems	3-0-0-3
AEC	HUM - 1	Business Ethics and Values	3-0-0-3
MD/IC	MD – 1	Fundamentals of Digital Electronics	3-0-2-4
SEC	VIC – 1	Fundamentals of Computer and Problem-Solving Techniques with lab	3-0-2-4
VAC	SC – 1	Understanding India	2-0-0-2
AEC	EL – 1	English I	3-0-0-3
Total Credits			22

SEMESTER II

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MDC	NS – 2	Applied Linear Algebra	3-0-0-3
	SS – 2	Principles of Economics	3-0-0-3
	HUM – 2	Fundamentals of Business Accounting	3-0-0-3
MD/IC	MD - 2	Computer Programming using Python with lab	3-0-2-4
SEC	VIC - 2	IT Workshop (Skylab/MATLAB) with lab	3-0-2-4
AEC	IL – 1	Modern Indian Languages	3-0-0-3
AEC	EL - 2	English II – Business Communication	3-0-0-3
Total Credits			23

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.)

SEMESTER III

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MDC	NS - 3	Discrete Mathematics	3-0-0-3
MD/IC	MDG – 1	Management Concepts and Practices	3-0-0-3
MD/IC	MDC - 1	Design Thinking and Innovation	3-0-0-3
MD/IC	MD - 3	Data Structures and Algorithms with Lab	3-0-2-4
MD/IC	MD - 4	Computer Organization and Architecture	3-0-0-3
VAC	SC - 2	Environmental Science	2-0-0-2
VAC	SC - 3	Health & well-being/Yoga	0-0-4-2
VAC	SC – 4	Digital & Technological Solutions with Lab	0-0-4-2
Total Credits			22

SEMESTER IV

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MDC	NS-4	Probability and Statistics	3-0-0-3
MD/IC	MDC-2	Fundamentals of Financial Management	3-0-0-3
MD/IC	MD - 5	Database Management Systems With Lab	3-0-2-4
MD/IC	MD - 6	Object Oriented Programming with Lab	3-0-2-4
MD/IC	MD - 7	Artificial Intelligence	3-0-0-3
MD/IC	MD – 8	Theory of Computation	3-0-0-3
Minor D/IC	MVG- 1	Accounting Software	0-0-4-2
SEC	MVC -1	Full Stack Development	0-0-4-2
Total Credits			24

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.

SEMESTER V

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MD/IC	MDG – 2	Human Resource Management and Organizational Behaviour	3-0-0-3
MD/IC	MDC – 3	Indian Financial System	3-0-0-3
MD/IC	MD - 9	Computer Networks With Lab	3-0-2-4
MD/IC	MD - 10	Compiler Design	3-0-2-4
MD/IC	MD - 11	Operating System with Lab	3-0-2-4
MD/IC	MD – 12	IT Infrastructure Management	3-0-0-3
Minor D/IC	MVG - 2	Financial Analysis and Planning	0-0-4-2
Comm. Engage		Community Engagement and Service	0-0-4-2
Total Credits			25

SEMESTER VI

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MD/IC	MDG - 3	Marketing Management	3-0-0-3
MD/IC	MDC - 4	Lean Start-Up Management	3-0-0-3
MD/IC	MD - 13	Information Security With Lab	3-0-2-4
MD/IC	MD - 14	Software Engineering and Agile Software Development with lab	3-0-2-4
MD/IC	MD - 15	Information System Control and Audit	3-0-0-3
MD/IC – SUMMER INTERNSHIP	MD - 16	Mini Project / Internship	0-0-8-4
Minor D/IC	MVC - 2	Data Analytics	0-0-4-2
Total Credits			23

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

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
Minor D/IC	EC - 1	Design Patterns / Data Warehousing and Data Mining	3-0-0-3
Minor D/IC	EC - 2	Service Oriented Architecture/ Machine Learning	3-0-0-3
Minor D/IC	EC - 3	Cyber Security and Cyber Crimes/ Deep Learning	3-0-0-3
Minor D/IC	MVG – 3	Advanced Financial Analysis and Planning	0-0-4-2
Minor D/IC	AMD -1	Security Analysis and Portfolio Management	3-0-2-4
Minor D/IC	AMD -2	MIS and ERP	3-0-0-3
Minor D/IC	AMD -3	Strategic Management	3-0-0-3
Total Credits			21

SEMESTER VIII

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
Minor D/IC	AMD – 4	Blockchain and Cryptocurrencies	3-0-0-3
Minor D/IC	AMD – 5	Big Data and Cloud Computing	3-0-2-4
Research	AMD – 6	Project Work / Internship	0-0-30-3
Dissertation	AMD – 7	Project Report	3
Project	AMD – 8	Project Presentation	3
	AMD – 9	Project Viva	3
	AMD - 10	Project Evaluation	3
Total Credits			22

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**

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
		Banking Technology Management	3-0-2-4
		Banking Operations Management	3-0-0-3
		Risk Management in Banks	3-0-0-3
		International Banking and Forex Trade	3-0-2-4
		Business Intelligence in Banking	3-0-0-3
		Digital Transformation for Banks	3-0-0-3
		Digital Assets Management	3-0-0-3
Total Credits			23

SEMESTER X

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
		Critical Thinking and Problem Identification / Research Methodology	3-1-0-4
		Internship / Research Project	0-0-36-10
		Industry / Expert Evaluation	2
		Documentation and Reporting	2
		Presentation	2
		Viva	2
Total Credits			22

M.B.A – FINANCIAL TECHNOLOGY**SEMESTER IX**

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
		Financial Technology Management	3-0-2-4
		Digital Business Models	3-0-0-3
		Entrepreneurship in Fintech	3-0-0-3
		Project Planning and Financing	3-0-0-3
		Applied Financial Analytics	2-0-2-3
		International Finance and Forex Trade	3-0-2-4
		Business Intelligence	2-0-2-3
Total Credits			23

SEMESTER X

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
		Critical Thinking and Problem Identification / Research Methodology	3-1-0-4
		Internship / Research Project	0-0-36-10
		Industry / Expert Evaluation	2
		Documentation and Reporting	2
		Presentation	2
		Viva	2
Total Credits			22

Semester Wise Syllabus - 2024-2029 for 5 Years Integrated B.Tech, M.B.A (CSBS & BT/FT)

SEMESTER I

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MDC	NS-1	Mathematics I -Fundamentals of Mathematics	3-0-0-3
	SS - 1	Fundamentals of Business Systems	3-0-0-3
AEC	HUM - 1	Business Ethics and Values	3-0-0-3
MD/IC	MD – 1	Fundamentals of Digital Electronics	3-0-2-4
SEC	VIC – 1	Fundamentals of Computer and Problem-Solving Techniques with lab	3-0-2-4
VAC	SC – 1	Understanding India	2-0-0-2
AEC	EL – 1	English I	3-0-0-3
Total Credits			22

Subject Code MDC / NS - 1	Subject title MATHEMATICS I - FUNDAMENTALS OF MATHEMATICS	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Acquire linear differential equations of higher order with constant coefficients. 2. Learn mathematical tools needed in evaluating multiple integrals and their usage. 		
<p>Learning Outcome:</p> <ol style="list-style-type: none"> 1. Understand Matrix Theory. 2. Solve higher order differential equations and different types of partial differential equations. 		
<p>Components of Teaching Type: Taught Course</p>		
<p>Unit I: MATRICES Rank of a Matrix- Consistency of system of equations. Eigenvalues and Eigenvectors of a real matrix - Characteristic equation - Properties of Eigenvalues and Eigenvectors. Cayley-Hamilton Theorem -Diagonalization of matrices by orthogonal Transformation.</p>		
<p>Unit II: DIFFERENTIAL EQUATIONS Exact equations, First order linear equations, Bernoulli's equation, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.</p>		
<p>Unit III: DIFFERENTIAL EQUATIONS (HIGHER ORDER) Linear differential equations of higher order with constant coefficients, the operator D, Euler's linear equation of higher order with variable coefficients, Solution by variation of parameter method.</p>		
<p>Unit IV: PARTIAL DIFFERENTIAL EQUATIONS Partial derivatives, Total derivatives, Differentiation of implicit functions, Maxima and Minima of two variables. Partial differential equations of higher order with constant coefficients.</p>		
<p>Unit V: VECTOR CALCULUS Gradient, divergence and curl - Directional derivative- Irrotational and Solenoidal vector fields - Gauss Divergence Theorem and Stoke's Theorem.</p>		
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> 1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, Sixth Edition, 2018. 2. Sivaramakrishna Das P. and Vijayakumar C., Engineering Mathematics, Pearsons, Fifth Edition, 2017. 3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley, Tenth Edition, 2019. 4. N.P. Bali and Manish Goyal, A TextBook of Engineering Mathematics, Lakshmi Publication, Ninth Edition, 2018. 5. C W. Evans, Engineering Mathematics:A Programmed Approach, Taylor & Francis, Tenth Edition, 2019. 		

Subject Code SS - 1	Subject Title FUNDAMENTALS OF BUSINESS SYSTEM	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To introduce concepts and theories related to business system in India To facilitate the application of the concepts and theories into business environment 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> To understand and appreciate the concepts of business systems To acquire required knowledge and demonstrate skills sets required business organizations 		
<p>Components of Teaching Type:</p> <p>Lecture, Discussion, Case studies, Presentation, Role plays and Management games</p>		
<p>Unit I: Introduction: 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.</p>		
<p>Unit – II: Business Environment – Concept – Significance – Factors influencing business – Social environment – Economic environment – Political environment – Technological environment – Legal environment - Environmental influence on Business.</p>		
<p>Unit- III: Financial system for Business: Monetary Policy - Instruments and its role in economy - Structure of Financial System – Financial Market – Financial Institutions - Instruments and Institutions – Financial instruments and services - Innovative Instruments.</p>		
<p>Unit IV: Business Economics: Nature and Scope and its Significance, Economics applied to Business Decisions, Theory of firm & industry Demand Analysis – Law of demand, determinants of demand, demand curve, consumer surplus, Elasticity of demand and Demand forecasting.</p>		
<p>Unit – V: Emerging Trends: Economic fluctuations and economic management – channels of monetary transmission - financing business- mobilization of savings and promoting productive investment - efficient resource allocation – Emerging developments and issues.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Stephen J. Skripak, Virginia Tech, Fundamentals of Business - 4th Edition, 2023. Pailwar V.K, Business Environment Paperback, Prentice Hall India Learning, 2014 Puri,V.K and Misra,S.K., Economic Environment Of Business, Himalaya Publishing House. Stephen J. Skripak, Fundamentals of Business Paperback, 2018 Mandal.S.K, Fundamentals of Business: Principles and Practice, 2008. https://iimm.org/wp-content/uploads/2019/04/IIMM_BE_Book.pdf https://pressbooks.lib.vt.edu/fundamentalsofbusiness3e/ 		

Subject Code AEC / HUM -1	Subject Title BUSINESS ETHICS AND VALUES	L T P C 3- 0- 0- 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To outline the concept of Indian Business system 2. To identify the importance of Business Ethics 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Remember the concept of Business Indian Business system 2. State the Business Ethics and Values 		
<p>Components of Teaching Type: Taught Course</p>		
<p>Unit I: Business Models 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.</p>		
<p>Unit II: Indian Business management Models and Values 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 21st century.</p>		
<p>Unit III: Business Ethics 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</p>		
<p>Unit IV: Types of Ethics 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.</p>		
<p>Unit V: Business Etiquettes 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.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. P. Kanagasabapathi, Indian Models of Economy, Business and Management.India: PHI Learning, 2013. 2. Tulsian, P. C. Business Organisation and Management. India: Pearson Education, 2002. 3. Senthil Kumar and Senthil Rajan ‘Business Ethics and Values’ Himalaya Publishing House. 2023 4. Tejpal, Sheth C. S. S. Chand’s Business Ethics and Communication (Question and Answers) (For CA-IPCC). India: S Chand & Company Limited, 2010. 		

Subject Code MD/IC / MD - 1	Subject Title Fundamentals of Digital Electronics	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To understand the binary number system and design a combinational logic circuit To design and implementations of the digital sequential circuits and various kinds of registers 		
<p>Learning Outcome:</p> <ol style="list-style-type: none"> Familiar with electronic components and able to apply in rectifier and amplifiers circuits. Analyze and construct the combinational and sequential logic circuits. 		
<p>Components of Teaching Type: Theoretical Lecture, and Hands-on simulation</p>		
<p>Unit I: Number System and logic gates 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, Algebraic Laws, AND, OR, NOR, NAND, EX-OR, EX-NOR Gates, Useful Boolean Identities, Algebraic Reduction, Complete Logic Sets, Arithmetic Operation using 1's and 2's Compliments, Signed Binary and Floating Point Number Representation, Introduction to logic families: DTL, TTL, MOS, CMOS, ECL.</p>		
<p>Unit: II: Combinational Logic Design 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</p>		
<p>Unit III: Sequential Network 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.</p>		
<p>Unit IV: Memory Elements and Arrays 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.</p>		
<p>Unit V: Introduction to VLSI design 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.</p>		
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> M. Morris Mano , Digital Logic and Computer Design by 11th Edition, Pearson Education, 2009 Malvino, A.P. and Leach, D.P., Digital Principles and Applications, 6th Ed., Tata McGraw-Hill. 2008. Thomas L. Floyd, Digital Fundamentals, Tenth Edition, Pearson Education, NewDelhi, 2009. Samir Palnitkar, Verilog HDL, Second Edition, Pearson Education, 2003. 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

Subject Code SEC/ VIC -1	Subject Title FUNDAMENTALS OF COMPUTER AND PROBLEM-SOLVING TECHNIQUES WITH LAB	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To identify the fundamental concepts of computers and problem solving. 2. To know the basics of algorithms, data organization and arrays. 		
<p>Learning Outcome:</p> <ol style="list-style-type: none"> 1. Explain the basic concepts of computers, computational thinking and problem solving. 2. Develop algorithmic solutions to array, merging, sorting & searching. 		
<p>Components of Teaching Type: <i>Taught course</i></p>		
<p>Unit I: Basics of Computers Computer Characteristics, Concept of Hardware, Software, Evolution of computer and Generations, Types of Computers – Analog and Digital computers, Hybrid Computers, General Purpose and Special Purpose Computer, Limitations of Computer Applications of Computer in Various Fields. Functional Block Diagram of Computer. CPU, ALU, Memory Unit, Bus Structure of Digital Computer – Address, Data and Control Bus.</p>		
<p>Unit II: Introduction to Data Computational Thinking - Information and Data - Converting Information into Data -Data Capacity -Data Types & Encoding - Logic-Solving Problems- Limits of Computation - Pseudocode & Flow Chart. Algorithmic Thinking: Algorithms – Software and Programming Languages - Actions. Data Organization: Name list, Graph Hierarchies - Spreadsheet's -Text processing – Patterns.</p>		
<p>Unit III: Fundamental Algorithms Exchanging - Counting – Summing - Factorial Computation – Fibonacci Sequence - Reversing the Digit-Base Conversion - Character to number conversion. Factoring Methods: Finding Square Root - Greatest Common Divisor - Prime Number - Prime Factor - Pseudo Random Number - Raising to Large Power - Computing nth Fibonacci number.</p>		
<p>Unit IV: Array Techniques 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.</p>		
<p>Unit V: Searching Techniques 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.</p>		
<p>List of Experiments:</p> <ol style="list-style-type: none"> 1. Program to exchange numbers. 2. Program to find the factorial of a number. 3. Program to reverse a digit and character to number conversion 4. Program using factoring methods (Square root, GCD, Prime Number) 5. Program for pseudorandom numbers 6. Program to reverse an array. 7. Program to count the elements in an array and to remove the duplicate elements. 		

8. Program using sorting techniques (merge, selection, Insertion, quick)
9. Program using search techniques (Binary, Linear, Hashing)
10. Program for pattern search (Linear, sub-Linear)
11. Program for Towers of Hanoi problem.
12. Program for Combination and permutation Generation.

Text and Reference Books:

1. **R. G.Dromey, how to solve it by Computer, PHI, 2008.**
2. David Riley and Kenny Hunt, Computational Thinking for Modern Problem Solver, Chapman & Hall / CRC Press, 2014.
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.
5. Harold Abelson & Gerald Jay Sussman, Structure and Interpretation of Computer Programs, McGraw- Hill, 1997.

SEMESTER II

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MDC	NS – 2	Applied Linear Algebra	3-0-0-3
	SS – 2	Principles of Economics	3-0-0-3
	HUM – 2	Fundamentals of Business Accounting	3-0-0-3
MD/IC	MD - 2	Computer Programming using Python with lab	3-0-2-4
SEC	VIC - 2	IT Workshop (Skylab/MATLAB) with lab	3-0-2-4
AEC	IL – 1	Modern Indian Languages	3-0-0-3
AEC	EL - 2	English II – Business Communication	3-0-0-3
Total Credits			23

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 MDC / NS - 2	Subject Title APPLIED LINEAR ALGEBRA	L T P C 3 0 0 3
Prerequisites: NIL		
Learning Objectives: <ol style="list-style-type: none"> 1. To learn the properties of a linear transformation and to analyze a linear system of equations 2. To learn to solve linear equations using different methods and to understand the applications of linear algebra in engineering 		
Learning Outcome: On completion of the course, the students will be able to: <ol style="list-style-type: none"> 1. Solve a linear system of equations using direct and iterative methods and Eigenvalue problems 2. Formulate linear equations for real life problems and solve them 		
Components of Teaching Type: Classroom Based Teaching		
Unit I: Vector spaces Vector spaces – Subspaces – Linear combinations and linear system of equations. Linear independence and Linear dependence – Basis and Dimension		
Unit II: Linear Transformations 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 Inner Product Spaces – Norms - Orthogonal vectors – Gram Schmidt orthogonalization process – Least Square Approximations		
Unit IV: Linear system of equations 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 Eigenvalue Problems: Power method – Inverse Power method - Jacobi’s rotation method Generalized Inverses QR decomposition - Singular Value Decomposition method		
Text and Reference Books: <ol style="list-style-type: none"> 1. Stephen H. Friedberg, Insel A.J. and Spence L.E., “Linear Algebra”, 4th. Edition, Prentice - Hall of India, New Delhi, 2003. 2. 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. 3. Strang G., “Linear Algebra and its Applications”, Thomson (Brooks/Cole), New Delhi, 2005. 4. Kumaresan. S., “Linear Algebra – A Geometric Approach”, PHI, New Delhi, 2010. 5. Faires J.D. and Burden R., “Numerical Methods”, Brooks/Cole (Thomson Publications), New Delhi, 2002. 		

Subject Code SS-2	Subject Title PRINCIPLES OF ECONOMICS	L T P C 3 0 0 3
Prerequisites: Nil		
Learning Objectives: 1. To impart economic theories and principles. 2. To assess the applicability of economic principles and theories in business		
Learning Outcomes: On completion of the course, the students will be able to: 1. Understand economic theories and principles. 2. Apply theories and principles for solving real world problems		
Components of Teaching Type: Taught courses		
UNIT I: INTRODUCTION: 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: 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: 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: 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 FUNDAMENTALS: Aggregate demand and supply- National income- Money and inflation-Theory of money-Business cycles- IS and IM curve-Monetary and fiscal policies.		
Text Books: 1. Mankiw, N. Gregory. Principles of Macroeconomics. United States: Cengage Learning, 2021. 2. Thomas, Christopher R., Maurice, S. Charles. Managerial Economics. United States: McGraw-Hill Irwin, 2008. 3. Mankiw, N. Gregory. Principles of Economics. United States: Cengage Learning, Incorporated, 2021. 4. Keat, Paul G., Young, Philip., Erfle, Steve. Managerial Economics, Global Edition. United Kingdom: Pearson Education, 2013.		

Subject Code HUM-2	Subject Title FUNDAMENTALS OF BUSINESS ACCOUNTING	L T P C 3-0-0-3
Prerequisites: Nil		
Learning Objectives: 1. To outline the concept of Bookkeeping 2. To recognise the process of recording the transaction		
Learning Outcome: On completion of the course, the students will be able to: 1. List the Book-keeping process 2. Prepare Journal, Ledger and Trial Balance		
Components of Teaching Type: Taught course		
Unit I: Accounting and Economic Decisions 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 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 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 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 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. Narayanaswamy, R.. Financial Accounting: A Managerial Perspective. India: Prentice Hall India Pvt., Limited, 2017. 2. T.S.Grewal – Introduction to Accountancy. India: S. Chand Limited, 2003. 3. K.L.Narang, S.N.Maheswari - Advanced Accountancy Volume-I, 11th Edition. N.p.: Vikas Publishing House, (n.d.). 2017		

Subject Code MD/IC / MD - 2	Subject Title COMPUTER PROGRAMMING USING PYTHON WITH LAB	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To understand basic problem-solving techniques using Python Programming Language To develop logical thinking abilities and to propose innovative solutions for real world problems through programming language constructs. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> Interpret the basic representation of the data structures, sequential programming, control framework Ability to propose solutions through reusable modules and to implement exemplary applications on real-world problems. 		
<p>Components of Teaching Type: Class Room Based Learning & Lab Assignment Based Learning</p>		
<p>Unit I:</p> <p>Introduction to Python Programming:</p> <p>Introduction to Python, Installing Python - Managing Projects - Using the Python IDE - Demo of Interactive and script mode - Writing Python Code - Running Python Programs - Tokens in Python – Variables, Keywords, Comments, Literals, Data types, Indentation, Operators and its precedence, Expressions, Input and Print functions. Sequential approach.</p>		
<p>Unit II:</p> <p>Control Structures:</p> <p>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.</p> <p>Collections:</p> <p>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.</p>		
<p>Unit III:</p> <p>Strings and Regular Expressions:</p> <p>Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Negative indices, String functions. Regular expression: Matching the patterns, Search and replace.</p>		
<p>Unit IV:</p> <p>Functions:</p> <p>Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Recursion and Lambda functions.</p>		
<p>Unit V:</p> <p>File Handling:</p> <p>Files: Open, Read, Write, Append and Close. Tell and seek methods</p> <p>Handling Exceptions:</p> <p>Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User-defined Exceptions, Defining Clean-Up actions.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, No starch Press, 2019. Martic 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, 2nd Edition, Wiley India Edition, 2017.

List of Lab Experiments (Indicative):

30 hours

1. *Sequential programs with python tokens, operators and expressions*
2. *Selectional and Looping constructs*
3. *List, Tuples, Dictionary and Sets*
4. *String Manipulation and Regular Expression*
5. *Functions, Recursion and Lambda functions*
6. *Files*
7. *Exception Handling*

Subject Code SEC / VIC - 2	Subject Title IT WORKSHOP USING MATLAB	L T P C 3 0 2 4
Prerequisites: NIL		
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. The course is intended for beginning users and those looking for a review. No prior programming experience or knowledge of MATLAB is assumed. 2. To introduce themes of data analysis, visualization, modelling, and programming are explored throughout the course, with an emphasis on practical application to finance, such as time-series analysis, Monte Carlo simulation, portfolio management, and empirical modelling. 		
<p>Learning Outcomes:</p> <p>On completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Working with the MATLAB user interface, entering commands and creating variables, Importing and organizing data from spreadsheets and other data sources 2. Working with financial data in MATLAB, working with dates and times, Visualizing data, Filtering datasets based on logical criteria 		
Components of Teaching Type: Classroom & hands-on practical session based learning		
<p>Unit I: Introduction to Matlab Software and Matlab Suite: Working with M-Files, Simulation Files, Functions and Scripts</p>		
<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>		
<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>		
<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>		
<p>Unit V: Visualization</p> <p>Calculus and Engineering Functions – Differentiation, Integration, Limit Function, Partial Derivatives for any function. Graphs and Plots.</p>		
<p>Text and Reference 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 		

Subject Code AEC / EL-2	Subject Title ENGLISH II – BUSINESS COMMUNICATION	L T P C 3 0 0 3
<i>Prerequisites: Basic Knowledge on grammar</i>		
Learning Objectives: 1. Apply and adapt flexible writing process strategies for business writing genres. 2. Use writing as a mode of thinking to research, innovate, and communicate new ideas.		
Learning Outcome: 1. Identify personal areas for improvement in common grammar, punctuation, and syntax errors. 2. Design a research proposal for the dynamics of workplace communication within a specific organization.		
Components of Teaching Type: Taught Course		
Unit I: Business Writing Fundamentals- Sentence Grammar and Punctuation: Independent Clauses- Sentence Fluency: Parallelism, Active/Passive Voice, Dangling and Misplaced Modifiers		
Unit II: Office Communication Genres of Office Communication- You-attitude and the Rhetorical Situation- Basic Document Design in Common Business Writing Genres- Group Discussion		
Unit III: Workplace Communication Case Study Research Set-up- Proposals in Business Writing- Ethics in Professional Research		
Unit IV: Workplace Communication Reports Written Report- Short Reports: Features, Purposes, and Design- Workplace Communication Report		
Unit V: Case Study Technical report for Business Case studies - Creative Project.		
Text and Reference Books: 1. Oliu, Brusaw, and Alred., Writing That Works: Communicating Effectively on the Job, Bedford/St. Martin’s publication, 2016. 2. Burroway, Janet, <i>Imaginative Writing: The Elements of Craft</i> , Penguin Publishers, 2010. 3. John M. Lannon, Laura J. Gurak, <i>Technical Communication</i> , Pearson, 2016. 4. Laura Brown, Rich Karlgaard, <i>The Only Business writing book you will ever read</i> , Forbes India Publication, 2019. 5. Natalie Canavor, <i>Business Writing Today</i> , Sage Publication, 2018.		

SEMESTER III

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MDC	NS - 3	Discrete Mathematics	3-0-0-3
MD/IC	MDG – 1	Management Concepts and Practices	3-0-0-3
MD/IC	MDC - 1	Design Thinking and Innovation	3-0-0-3
MD/IC	MD - 3	Data Structures and Algorithms with Lab	3-0-2-4
MD/IC	MD - 4	Computer Organization and Architecture	3-0-0-3
VAC	SC - 2	Environmental Science	2-0-0-2
VAC	SC - 3	Health & well-being/Yoga	0-0-4-2
VAC	SC – 4	Digital & Technological Solutions with Lab	0-0-4-2
Total Credits			22

Subject Code MDC / NS - 3	Subject Title DISCRETE MATHEMATICS	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To develop a foundation of set theory concepts and explore a variety of various mathematical structures by focusing on mathematical objects, operations, and resulting properties 2. To develop formal logical reasoning techniques and concept of relation through various representations 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. <i>Construct</i> proofs using direct proof, proof by contraposition, proof by contradiction, and proof by cases. 2. Demonstrate the ability to solve problems using counting techniques and combinatory in the context of discrete probability. 		
<p>Components of Teaching Type: Classroom based Learning</p>		
<p>Unit I: Set Theory</p> <p>Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions, Growth of Functions, Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, and Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.</p>		
<p>Unit II: Algebraic Structures</p> <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.</p>		
<p>Unit III: Partial order sets</p> <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. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.</p>		
<p>Unit IV: Propositional Logic</p> <p>Proposition, 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>		
<p>Unit V: Trees</p> <p>Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatory, Introduction, Counting Techniques, Pigeonhole Principle.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Elements of Discrete Mathematics – Liu and Mohapatra, McGraw Hill Publications, 2017 		

2. **Discrete Mathematical Structures – B. Kolman, R.C. Busby, and S.C. Ross, PHI Publications, Third edition, 2016**
3. Discrete Mathematical Structures with Application to Computer Science – Jean Paul Trembley and R Manohar, McGraw-Hill Publications, 2017
4. Discrete and Combinatorial Mathematics – R.P. Grimaldi, Addison Wesley, 2006
5. Discrete Mathematics and Its Applications – Kenneth H. Rosen, McGraw-Hill 8th edition, 2021

Subject Code MD/IC - MDG-1	MANAGEMENT CONCEPTS AND PRACTICES	L T P C 3 0 0 3
Learning Objectives:		
<ol style="list-style-type: none"> To provide an understanding of basic management concepts, principles, and practices. To develop strategic planning and decision-making strategies in an organization. 		
Learning Outcome:		
On completion of the course, the students will able to:		
<ol style="list-style-type: none"> To develop an understanding of staffing, leadership, and motivation in an organization. To predict the dynamics of control and its emerging issues in management. 		
Components of Teaching Type:		
Lecture, Discussion, Case studies, observations, presentation, role plays, problem and games.		
<p>Unit I: Introduction to Management: 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.</p>		
<p>Unit II: Planning – Concept, Importance, Types and Process, Strategic Management Overview and Process; MBO, MBE: Decision Making Concept, Process, Types, Techniques and Importance.</p>		
<p>Unit III: Organising- Principles, Structure, Process, Importance: Organisational Design: Departmentation: Span of Control; Delegation of Authority; Decentralisation of Authority, Organisation Charts.</p>		
<p>Unit IV: Staffing - 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.</p>		
<p>Unit V: Directing and Controlling- 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.</p>		
Text Books:		
<ol style="list-style-type: none"> Robbins, Stephen P., and Mary Coulter. Management 15E. Pearson India, Latest 2021 Michael A.Hitt,J Stewart Black & Layman W.Porter. Management Pearson India, Latest 2012 Knootz & O-Donnel “Essentials of Management”,Mc.GrawHill,1986. Neeru Vasistha “Priciples of Management”,Taxmann,2022. Peter F.Drucker “The Practice of Management”,Elsvier,2007 Stoner J A and Freeman R E,“Management” Parkinson C N and Rustomji M K and Sapre S A,“Great Ideas in Management” LM Prasad,“Principles and Practices of Management” 		

Subject Code MDC/IC – MDC-1	Subject Title DESIGN THINKING AND INNOVATION	L T P C 3-0-0-3
<p>Learning 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>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Understand the process of generating and develop design ideas through different technique 2. Describe various design process procedure 		
<p>Components of Teaching Type: Taught Course</p>		
<p>Unit I: Identifying Customer Needs and Product Specifications</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>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>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>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>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. 4. 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. 		

Subject Code MD/IC – MD-3	Subject Title DATA STRUCTURES AND ALGORITHMS WITH LAB	L T P C 3 0 2 4
Prerequisites: Basics of problem-solving approaches		
Learning Objectives: <ol style="list-style-type: none"> To understand the basic concepts of data structures and algorithms. To differentiate linear and non-linear data structures and the operations upon them. 		
Learning Outcome: On completion of the course, the students will be able to: <ol style="list-style-type: none"> Understanding the fundamental analysis and time complexity for a given problem. Articulate linear and non-linear data structures and legal operations permitted on them. 		
Components of Teaching Type: Lecture, Discussion, Case studies, Assignments and Hands-on practice		
Unit I - Introduction to Algorithms and Analysis Overview and importance of algorithms and data structures. Fundamentals of algorithm analysis, Space and time complexity of an algorithm, Types of asymptotic notations and orders of growth, Algorithm efficiency – best case, worst case, average case, Analysis of non-recursive and recursive algorithms, Asymptotic analysis for recurrence relation – Recursive Tree Method.		
Unit II - Linear and Non-linear Data Structures Array- 1D and 2D array , Stack - Applications of stack: Expression Evaluation - Conversion of Infix to postfix and prefix expression, Tower of Hanoi. Queue - Types of Queue: Circular Queue, Double Ended Queue (deQueue), Applications – Priority Queue using Arrays - List - Singly linked lists – Doubly linked lists - Circular linked lists, Applications -Polynomial Manipulation - Josephus problem(permutation).		
Unit III - Sorting and Search Techniques Searching - Linear Search and binary search, Applications - Finding square root of ‘n’-Longest Common Prefix. Sorting – Insertion sort - Selection sort – Bubble sort – (Counting Sort) - Quick sort-Merge sort , Analysis, Applications - Finding the ‘n’ closest pair’s		
Unit IV – Trees and Graphs Trees - Tree Traversals, Expression Trees – Binary Search Trees – operations in BST – insertion, deletion, finding min and max, Finding the kth minimum element in a BST, Applications – Dictionary. Graph – Representation of Graph – Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS) - Minimum Spanning Tree: Prim's, Kruskal's- Single Source Shortest Path: Dijkstra’s Algorithm		
Unit V- Hashing, Heaps and Balanced Binary Search Trees, Hash functions, open hashing-separate chaining, closed hashing - linear probing, quadratic probing, double hashing, random probing, rehashing, extendible hashingApplications – Dictionary-Telephone directory. Heaps - Heap sort, Applications -Priority Queue using Heaps. AVL trees – Terminology - basic operations(rotation, insertion and deletion. Recent trends in algorithms and data structures		
Text Books: <ol style="list-style-type: none"> Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L., Stein, Clifford. Introduction To Algorithms. India: MIT Press, 2001. 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. 		

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

List of indicative Experiments

30 Hours

1. Implementation of Stack and its applications
2. Implementation of queue and its applications
3. Linked List
4. Searching algorithm
5. Sorting algorithm – insertion, bubble, selection etc.
6. Randomized Quick sort and merge sort
7. Binary Tree traversals
8. Binary search tree
9. DFS, BFS
10. Minimum Spanning Tree – Prim’s and Kruskal’s
11. Single source shortest path algorithm – Connected Components and finding a cycle in a graph

Tools/Software:

C,C++, Java and Open source software and tools

Subject Code MD/IC-MD - 4	Subject Title COMPUTER ORGANIZATION AND ARCHITECTURE	L T P C 3 0 0 3
Learning Objectives:		
<ol style="list-style-type: none"> To familiarize basic concepts of computer architecture and organization, implementation of arithmetic operations in the computer. To develop a deeper understanding of the hardware environment upon which all types of processing are carried out and about internals of memory systems and interfacing techniques. 		
Learning Outcome:		
<p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Identify and explain the building blocks of computer and Recognize various addressing modes, and data/instruction formats. Identify the design issues in the development of processor or other components (Memory, I/O systems etc.,) 		
Components of Teaching Type: Class Room Based Learning & Lab Assignments		
Unit I: Introduction and overview of computer architecture		
Introduction to computer systems - Overview of Organization and Architecture - Overview of 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		
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		
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, Communication and Device Subsystems		
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:		
Classification of models - Flynn’s taxonomy of parallel machine models (SISD, SIMD, MISD, MIMD) - Introduction to Pipelining-Pipelined data path-Hazards - Multiprocessor architecture: Overview of 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 		

SEMESTER IV

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MDC	NS-4	Probability and Statistics	3-0-0-3
MD/IC	MDC-2	Fundamentals of Financial Management	3-0-0-3
MD/IC	MD - 5	Database Management Systems With Lab	3-0-2-4
MD/IC	MD - 6	Object Oriented Programming with Lab	3-0-2-4
MD/IC	MD - 7	Artificial Intelligence	3-0-0-3
MD/IC	MD – 8	Theory of Computation	3-0-0-3
Minor D/IC	MVG- 1	Accounting Software	0-0-4-2
SEC	MVC -1	Full Stack Development	0-0-4-2
Total Credits			24

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 MDC – NS-4	Subject Title PROBABILITY AND STATISTICS	L T P C 3 0 0 3
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: <ol style="list-style-type: none"> Understanding the fundamentals of statistics and important statistical techniques and models. Applying statistical tools for solving the business related problems. 		
Components of Teaching Type: Lecture, Discussion, Case studies, Assignments and Hands-on practice		
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 Gupta. S.P ‘Statistical Methods’ Sultan Chand & Sons, 48^h Edition, 2022 James T. McClave, George Benson, & Terry L. Cincich, “Statistics for Management and Economics” New International Edition, 2013. Hooda, R. P. Statistics for business and economics. Vikas Publishing House, 2013. Davis, Glyn, and Branko Pecar. Business statistics using Excel. Oxford University Press, 2013 		

Subject Code MD/IC-MDC-2	Subject Title FUNDAMENTALS OF FINANCIAL MANAGEMENT	L T P C 3-0-0-3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To Explain the Basic Financial Functions To Describe the various Financial Decisions 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Understand the Financial Management Functions Make / Take Financial Decisions 		
<p>Components of Teaching Type:</p>		
<p>Unit I: Introduction to Financial Management</p> <p>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.</p>		
<p>Unit II: Financial Decision</p> <p>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.</p>		
<p>Unit III: Investment Decision</p> <p>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.</p> <p>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</p>		
<p>Unit IV: Dividend Decision</p> <p>Dividend Decisions: Introduction, Traditional Approach, Dividend Relevance Model, Miller and Modigliani Model, Stability of Dividends, Forms of Dividends, Stock Split.</p>		
<p>Unit V: Liquidity Decision</p> <p>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.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Khan, M. Y., Jain, P. K.. Financial Management. India: Tata McGraw-Hill, 1984. Pandey, I. M.. Financial Management. India: Vikas Publishing House, 1979. Chandra, Prasanna. Financial Management. India: McGraw-Hill Education (India) Pvt Limited, 2011. Van Horne, James C.. Financial management and policy. United Kingdom: Prentice Hall, 1998. Brigham, Eugene F., Ehrhardt, Michael C.. Financial Management. Singapore: South-Western/Thomson Learning, 2001. 		

Subject Code MD/IC-MD-5	Subject Title DATABASE MANAGEMENT SYSTEMS WITH LAB	L T P C 3 0 2 4
Learning Objectives: <ol style="list-style-type: none"> 1. To understand the various data models, conceptualize E-R diagrams and depict using relational models. 2. To impart knowledge on data storage and transaction processing, concurrency control techniques and recovery procedures. 		
Learning Outcome: <ol style="list-style-type: none"> 1. Explain the concepts of Database Management System, ER model and Relational Models for a given application. 2. Manipulate and build database queries using Structured Query Language and relational algebra. 		
Components of Teaching Type: Taught Course		
Unit I: Introduction Database Systems– Data Models – Database System Architecture - Entity-Relationship Model - ER Diagram- Extended ER Model –ER into Relational Model - Relational Model: Structure of Relational Databases, Database Schema, Keys, Tables.		
Unit II: Relational Database Relational Algebra – Extended-Relational Algebra Operations –SQL: Introduction – DDL – DML – Integrity Constraints-Set Operations-Joins – Nested Queries -View- Trigger - Stored Procedures		
Unit III: Database Design Introduction to Schema Refinement – Decomposition – Lossless Decomposition – Functional Dependencies – Normal Forms - First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form.		
Unit IV: Storage and Transaction Management RAID - File Organization - Indexing, Ordered Index, Index files, Hashing - Static and dynamic hashing. Transaction concepts and states– Concurrent Execution-Serializability-Concurrency Control:Lock based Protocol - Timestamp based Protocol - Recovery System: – Log-Based Recovery – Shadow Paging		
Unit V: Advanced Databases NoSQL – Document Database: MongoDB - Multi-dimensional: Cassandra – Case study		
List of Experiments: <ol style="list-style-type: none"> 1. Students should decide on a case study and formulate the problem statement. 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. 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. 4. Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form 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 6. Practicing DML commands- Insert, Select, Update, Delete 		

7. Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc.
8. Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi).
9. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
10. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger
11. Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.
12. Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.

Text and Reference Books:

1. **Silberschatz, Korth, Sudarshan, Database System Concepts, McGraw-Hill Higher Education, International edition, 2019.**
2. Ramez Elmasri, and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, Seventh Edition, 2016.
3. 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.

Subject Code MD/IC- MD - 6	Subject Title OBJECT ORIENTED PROGRAMMING WITH LAB	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To introduce the concepts of Basic Object Oriented concepts and Programming Basics. To apply object-oriented concepts to solve real time computing problems. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Understand the concepts of object oriented programming elements and constructs. Solve various real-world problems by applying OO concept and modelling. 		
<p>Components of Teaching Type: Board, Presentation, hands-on practice</p>		
<p>Unit I: Fundamentals of Object-Oriented Programming Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object, functions and data members</p>		
<p>Unit: II: Constructors and Destructors Constructors – default constructor, Parameterized constructors, Constructor with dynamic allocation, copy constructor. Destructors – operator, overloading, overloading through friend function, overloading the assignment operator type conversion, explicit constructor</p>		
<p>Unit III: Essentials of Object-Oriented Programming Operator overloading, Inheritance – Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling</p>		
<p>Unit IV: Generic Programming and I/O Generic Programming: Template concept, class template, function template, template specialization , Input and Output: Streams, Files, Library functions, formatted output</p>		
<p>Unit V: Object Oriented Design And Modelling UML concept, Use case for requirement capturing, Class diagram, Activity diagram and Sequence Diagram for design, Corresponding code from design</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> BjarneStroustrup, “The C++ Programming Language “, Fourth Edition, Addison Wesley, 2013. Debasish Jana,” C++ and Object-Oriented Programming Paradigm”, Third Edition, PHI Learning Pvt. Ltd, 2014. E Balagurusamy, “Object-Oriented Programming with C++”, 7th Edition,2017 Yashavant Kanetkar , “ Let Us C++”, BPB Publications, 2020. 2. Scott Meyers “Effective Modern C++”, Shroff/O’Reilly; First Edition,2014. 		
<p>Lab Exercises</p> <ol style="list-style-type: none"> Programs on concept of classes and objects Programs using friend functions Programs using static polymorphism Programs using constructors Programs using inheritance Programs on dynamic polymorphism Programs on exception handling 		

8. Programs on generic programming using template function & template class
9. Programs on file handling
10. Study of different UML diagrams based on usecases

Tools/Software:

C++/ Java / Python etc.

Subject Code MD/IC-MD-7	Subject title ARTIFICIAL INTELLIGENCE	L T P C 3 0 0 3
<p>Learning Objectives:</p> <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. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Apply basic principles of AI in solutions that require problem-solving, inference, perception, knowledge representation, and learning. Demonstrate knowledge of reasoning and knowledge representation for solving real-world problems. 		
<p>Components of Teaching Type: Taught courses</p>		
<p>Unit I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE 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.</p>		
<p>Unit II: PROBLEM-SOLVING BY SEARCHING 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.</p>		
<p>Unit III: LOCAL SEARCH AND ADVERSARIAL SEARCH 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.</p>		
<p>Unit IV: KNOWLEDGE AND REASONING 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.</p>		
<p>Unit V: KNOWLEDGE REPRESENTATION 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.</p>		
<p>Text Books:</p> <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. 		

Subject Code MD/IC-MD-8	Subject Title THEORY OF COMPUTATION	L T P C 3 0 0 3
<p>Learning 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>Learning Outcome: On completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata. Identify limitations of some computational models and possible methods of proving them. 		
<p>Components of Teaching Type: Lecture, Discussion, Case studies, Assignments and Hands-on practice</p>		
<p>Unit I - Introduction to Languages and Grammars: Recall on Proof techniques in Mathematics -Overview of a Computational Models - Languages and Grammars - Alphabets - Strings - Operations on Languages, Overview on Automata Finite Automata (FA) - Deterministic Finite Automata (DFA) - Non-deterministic Finite Automata (NFA) - NFA with epsilon transitions – NFA without epsilon transition, conversion of NFA to DFA, Equivalence of NFA and DFA – minimization of DFA</p>		
<p>Unit II - Regular Expressions and Languages: 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>		
<p>Unit III - Context Free Grammars: Context-Free Grammar (CFG) – 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>		
<p>Unit IV Pushdown Automata and Turing Machine: Definition of the Pushdown automata - Languages of a Pushdown automata – Power of Non-Deterministic Pushdown Automata and Deterministic pushdown automata Turing Machines as acceptor and transducer - Multi head and Multi tape Turing Machines – Universal Turing Machine - The Halting problem - Turing-Church thesis</p>		
<p>Unit V- Recursive and Recursively Enumerable Languages: Recursive and Recursively Enumerable Languages, Language that is not Recursively Enumerable (RE) – computable functions – Chomsky Hierarchy – Undecidable problems - Post’s Correspondence Problem. Recent Trends & Future of Formal Languages and Automata</p>		
<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. Peter Linz, “An Introduction to Formal Languages and Automata”, Sixth Edition, Jones & Bartlett, 2016. ISBN: 978-9384323219 Micheal Sipser, Introduction of the Theory and Computation, Cengage; 3rd edition, 2014. Dexter C. Kozen, “ Automata and Computability”, Springer; Softcover reprint of the original 1st ed. 1997 edition. 2012 		

Minor D/IC / MVG- 1	Subject Title ACCOUNTING SOFTWARE	L T P C 0- 0 -4 -2
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To explain the process of selecting and using accounting software 2. To Demonstrate the process of preparing the Accounts using Spreadsheet / Tally 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Understand the preparation and application of Accounting Software 2. Creation of Vouchers, Ledgers, Inventory Report, BRS, Tax and Payroll 		
<p>Components of Teaching Type: Taught Course</p>		
<p>Unit I: Accounting Software</p> <p>Various Accounting Softwares – 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.</p>		
<p>Unit II: Voucher Entries</p> <p>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</p>		
<p>Unit III: Inventory Management and Tax Calculation</p> <p>Order processing – Reorder levels – Bill of Materials - TDS Reports and Filing – GST Returns – Professional Tax.</p>		
<p>Unit IV: Payroll Accounting</p> <p>Employee creation – Salary Definition – Employee Attendance Register – Pay heads creation – salary Report preparation -</p>		
<p>Unit V: Generating Reports</p> <p>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</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Official Guide to Financial Accounting using Tally Prime: Managing Your Business Just Got Simpler (English Edition). N.p.: BPB Publications, 2021. 2. Official Guide to Financial Accounting using Tally.ERP 9. India: BPB Publications, 2018. 		

Subject Code SEC/ MVC - 1	Subject Title FULL STACK SOFTWARE DEVELOPMENT	L T P C 0 0 4 2
<p>Learning 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>Learning Outcomes:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Develop GUI applications with Python and use the collaborative version control system, Package the developed code in Linux and Windows environment. Deploy the developed web application using Flask in real time scenarios such as AWS. 		
<p>Components of Teaching Type: Classroom and Hands-on practical based learning</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 In Python 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 Mongoddb – 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 and Reference 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. 		

SEMESTER V

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MD/IC	MDG – 2	Human Resource Management and Organizational Behaviour	3-0-0-3
MD/IC	MDC – 3	Indian Financial System	3-0-0-3
MD/IC	MD - 9	Computer Networks With Lab	3-0-2-4
MD/IC	MD - 10	Compiler Design	3-0-2-4
MD/IC	MD - 11	Operating System with Lab	3-0-2-4
MD/IC	MD – 12	IT Infrastructure Management	3-0-0-3
Minor D/IC	MVG - 2	Financial Analysis and Planning	0-0-4-2
Comm. Engage		Community Engagement and Service	0-0-4-2
Total Credits			25

Subject Code MD/IC - MDG - 5	Subject Title HUMAN RESOURCE MANAGEMENT AND ORGANISATIONAL BEHAVIOUR	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To Understand the Human Resource Management concepts 2. To Illustrate the applicability of the concept of organisational behaviour, its theories and models. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Demonstrate an understanding of key terms, theories/concepts and practices within the field of HRM 2. Analyse different models used to explain individual behaviour related to motivation, personality and leadership 		
<p>Components of Teaching Type: Taught Course</p>		
<p>Unit I:</p> <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:</p> <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:</p> <p>Fundamentals of Organizational Behaviour: Organisational behaviour -concept and significance; OB Models & Approaches, WorkForce Diversity, Organizational Justice OB Trends. Individual Processes and Behavior: organizational culture Personality and values, Perception, Attitude, Learning, Motivation, Managing Emotions and Stress Moods.</p>		
<p>Unit IV:</p> <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:</p> <p>Group Dynamics and Team Development: 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 Behavior</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Gary Dessler & Biju Varrkey, “Human Resource Management” ,Sixteenth Edition , Pearson - 2020 2. K Aswathappa and Sadhna Dash, Human Resource Management - Text and Cases 9th Edition - 2021 3. Hellreigel, Don, John W. Slocum, Jr., and Richard W. Woodman: Organizational Behavior, South Western College Publishing, Ohio 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. 		

MD/IC- MDC-3	INDIAN FINANCIAL SYSTEM	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 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. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. To understand and appreciate the concepts of Financial institution, markets and services. 2. To acquire required knowledge and demonstrate skills sets required for BFSI sectors. 		
<p>Components of Teaching Type:</p> <p>Lecture, Discussion, Case studies, observations, presentation, role plays, problem and games.</p>		
<p>Unit I: Concept Of Financial System- 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.</p>		
<p>Unit II: Indian Financial Institutions: 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.</p>		
<p>Unit III: Capital Market: 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.</p>		
<p>Unit IV: Insurance in India: Insurance system- Insurance markets- Insurance Industry- Insurance Act-IRDA, Life and General Insurance- Recent development in Insurance- Future Insurance Opportunities</p>		
<p>Unit V: Merchant Banking: 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</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 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, 7. Khan and Jain, Financial Services, Tata McGraw Hill Singh, J.K., 		

Subject Code MD/IC – MD-9	Subject Title COMPUTER NETWORKS WITH LAB	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To study the fundamental concepts of computer networking, protocols, architectures, and applications. To help students to acquire knowledge in design, implement and analyze performance of OSI and TCP-IP based Architectures. 		
<p>Learning Outcome: On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Contrast different types of switching networks and analyse the performance of network, implement various error detection and correction mechanisms, flow control mechanisms and various routing protocols. Design subletting and analyse the performance of network layer, Construct and examine various routing protocols. 		
<p>Components of Teaching Type: Taught and Laboratory course</p>		
<p>Unit I: INTRODUCTION TO COMPUTER NETWORKS 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 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 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 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 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>		
<p>Text Books:</p> <ol style="list-style-type: none"> William Stallings. Data and computer communications. Pearson Education India, 2013. Tanenbaum, Computer Networks, Pearson Education, 5th Edition, 2013. Larry L. Peterson, Bruce S. Davie, "Computer networks: a systems approach", 4th Edition, Harcourt Asia, 2007. 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

Subject Code MD/IC- MD - 10	Subject Title COMPILER DESIGN	L T P C 3 0 0 3
Learning Objectives: 1. To familiarize concepts of language translation and phases of compiler design 2. To understand the design of parser by parsing LL parser and LR parser and to demonstrate intermediate code using technique of syntax directed translation and		
Learning Outcome: On completion of the course, the students will able to: 1. Use compiler construction tools and describes the Functionality of each stage of compilation process 2. Construct Grammars for Natural Languages and find the Syntactical Errors/Semantic errors during the compilations using parsing techniques and Analyse different representations of intermediate code.		
Components of Teaching Type: Class Room based Learning/ Lab Assignments		
Unit I: Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction. Lexical analysis: interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis. Error reporting. Implementation. Regular definition, Transition diagrams.		
Unit II: Syntax analysis: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, LR parsers (SLR, LALR, LR). Syntax directed definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.		
Unit III: Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions. Run time system: storage organization, activation tree, activation record, stack allocation of activation records, parameter passing mechanisms.		
Unit IV: Intermediate code generation: intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls. Implementation issues.		
Unit V: Code generation and instruction selection: Issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from DAGs, peep hole optimization, code generator generators, specifications of machine.		
Text Books: <ol style="list-style-type: none"> 1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman (2007), Compilers Principles, Techniques and Tools, 2nd edition, Pearson Education, New Delhi, India. 2. Alfred V. Aho, Jeffrey D. Ullman (2001), Principles of compiler design, Indian student edition, Pearson Education, New Delhi, India. 3. Kenneth C. Loudon (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. 5. Andrew W. Appel (2004), Modern Compiler Implementation C, Cambridge University Press, UK 		

Subject Code MD/IC-MD-11	Subject Title OPERATING SYSTEM WITH LAB	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To introduce the operating system concepts, designs and provide skills required to implement the services. 2. To develop the knowledge for application of the various design issues and services. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Interpret the evolution of OS functionality, structures, layers and apply various types of system calls of various process states. 2. Implement page replacement algorithms, memory management problems and segmentation. 		
<p>Components of Teaching Type: Taught and Laboratory course</p>		
<p>Unit I: INTRODUCTION TO OS PRINCIPLES</p> <p>Introduction to OS: Functionality of OS - OS design issues - Structuring methods (monolithic, layered, modular, micro-kernel models) - Abstractions, processes, resources - Influence of security, networking, and multimedia. System calls, System/Application Call Interface – Protection: User/Kernel modes - Interrupts -Processes - Structures (Process Control Block, Ready List etc.), Process creation, management in Unix – Threads: User level, kernel level threads and thread models.</p>		
<p>Unit II: SCHEDULING</p> <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> <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> <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> <p>Virtual Machines - Virtualization (Hardware/Software, Server, Service, Network - Hypervisors - Container virtualization - Cost of virtualization - File system interface (access methods, directory structures) - File system implementation (directory implementation, file allocation methods) - File system recovery - Journaling - Soft updates - Log-structured file system - Distributed file system</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 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

Subject Code MD/IC-MD-12	Subject Title IT INFRASTRUCTURE MANAGEMENT	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To expose the emerging areas of IT Infrastructure and its Management focuses on the IT governance and risk management. 2. To understand the risk management framework, IT infrastructure management, ITIL service delivery and other frameworks 		
<p>Learning Outcome: On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. To gain knowledge in IT infrastructure management services. 2. To acquire practical knowledge to develop IT infrastructure management for banks. 		
<p>Components of Teaching Type: Lecture, Discussion, Case studies, observations, presentation, problem and games</p>		
<p>Unit I: Server Management–Storage Management–Application Management–Information Life Cycle Management–Network Management– Security Management– Tools and Standards for Server, Storage, Application, Information Life Cycle Management, Network and Security Management</p>		
<p>Unit II: IT Services Management– Service Management as a practice– Service strategy principles–Service economics–Strategy and Organization–Strategy, tactics and operations –Service Design principles–Service Design processes–Service Design Technology related activities –Implementing Service Design</p>		
<p>Unit III: Service Transition principles– Service Transition processes– Service Transition common operations–Implementing service transition–challenges, critical success factors and risk.</p>		
<p>Unit IV: Service Operation principles-Service Operation processes–Common Service Operation activities –Implementing service operation</p>		
<p>Unit V: Continual Service Improvement principles- Continual Service Improvement processes – Continual Service Improvement methods and techniques–Implementing Continual Service Improvement.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Office of Government Commerce, —ITIL–Service Strategy, TSO, London, 2007 2. EMC, Information Storage Management: —Storing, Managing and Protecting Digital Information, Wiley2009 3. Gilbert Held, Server Management, Best Practices Series, Aurebach Publications, 2000. 4. Stephan R.Kass, —Information Life Cycle Management, Wood head Publishing, 2006 5. Alexander Clemm, Network management Fundamentals, Cisco Press, 2012 		

Subject Code Minor D/IC – MVG-2	Subject Title FINANCIAL ANALYSIS AND PLANNING	L T P C 0-0-4-2
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To illustrate Personal Financial Management To demonstrate how to handle personal money and making Financial plan 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Execute personal financial plan Implement smart investment strategy 		
<p>Components of Teaching Type: Taught Course</p>		
<p>Unit I: Personal Financial Management 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</p>		
<p>Unit II: Personal Financial Planning 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</p>		
<p>Unit III: Personal Investment Avenues 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</p>		
<p>Unit IV: Personal Financial Risk Management 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.,</p>		
<p>Unit V: Personal Debt Management 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)</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Dr. Nilesh Uttamrao Bankar Dr. Mohsin Abbas Tamboli, Personal Financial Planning, [ECH Master]. Canada: B.C. College and Institute Library Services, 2010. Kapoor, Jack R., Dlabay, Les R., Hughes, Robert J., Hart, Melissa. Personal Finance. N.p.: McGraw-Hill Education (Australia) Pty Limited, 2016. 		

SEMESTER VI

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
MD/IC	MDG - 3	Marketing Management	3-0-0-3
MD/IC	MDC - 4	Lean Start-Up Management	3-0-0-3
MD/IC	MD - 13	Information Security With Lab	3-0-2-4
MD/IC	MD - 14	Software Engineering and Agile Software Development with lab	3-0-2-4
MD/IC	MD - 15	Information System Control and Audit	3-0-0-3
MD/IC – SUMMER INTERNSHIP	MD - 16	Mini Project / Internship	0-0-8-4
Minor D/IC	MVC - 2	Data Analytics	0-0-4-2
Total Credits			23

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.

MD/IC - MDG-3	MARKETING MANAGEMENT	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To familiarize problems and identify processes to solve them. To understanding and recognise the need to regularly challenge all knowledge. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> To acquire the key analytical frameworks and tools used in marketing. To Apply key marketing theories, frameworks and tools to solve Marketing problems. 		
<p>Components of Teaching Type:</p> <p>Lecture, Discussion, Case studies, observations, presentation, role plays, problem and games</p>		
<p>Unit I:</p> <p>Introduction: 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.</p>		
<p>Unit II:</p> <p>An Introduction to Retail System: 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.</p>		
<p>Unit III:</p> <p>Introduction to brand management: 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.</p>		
<p>Unit IV:</p> <p>Marketing Research: 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.</p>		
<p>Unit V:</p> <p>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. 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.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Kotlar, Philip, Marketing Management, Prentice Hall, New Delhi,10 edition,2000. Stanton, Etzel, Walker, Fundamentals of Marketing, Tata-McGraw Hill, New Delhi,2023. Saxena, Rajan, Marketing Management, Tata-McGraw Hill, New Delhi,2009. McCarthy, E.J., Basic Marketing: A managerial approach, Irwin, New York,1984. Jaiswal Bimal, International Business, Himalyan Publishing Houser,2012. Mithani D.M , Economics of Global Trade and Finance, Himalyan Publishing Houser. CheruniLay Francis, International Trade and Export Management, Himalyan Publishing House. 		

Subject Code MD/IC – MDC-4	Subject Title LEAN START-UP MANAGEMENT	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To enable the students to face the challenges of starting new ventures. To prepare the students for starting new business and the skills 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Understand the process of starting new ventures Develop ideas and Execute as Business 		
<p>Components of Teaching Type: Taught courses</p>		
<p>UNIT I: ENTREPRENEURIAL JOURNEY: 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</p>		
<p>UNIT II: ROLE OF GOVERNMENT: 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</p>		
<p>UNIT III: STARTUP FINANCES AND CAPITAL REQUIREMENTS-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</p>		
<p>UNIT IV: DEVELOPING AND PRESENTING STARTUP BUSINESS PLAN: 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</p>		
<p>UNIT V: LAUNCHING AND MANAGING THE STARTUP ENTERPRISE: 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</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Barringer, Bruce R., Ireland, R. Duane. Entrepreneurship: Successfully Launching New Ventures. United Kingdom: Pearson Education, 2019. Hisrich, Robert D., Ramadani, Veland. Effective Entrepreneurial Management: Strategy, Planning, Risk Management, and Organization. Germany: Springer International Publishing, 2016. Drucker, Peter. Innovation and Entrepreneurship. United Kingdom: Taylor & Francis, 2014. Timmons, Jeffrey., Spinelli, Stephen. New Venture Creation: Entrepreneurship for the 21st Century. United Kingdom: McGraw-Hill Education, 2009. 		

Subject Code MD/IC-MD-13	Subject Title Information Security with LAB	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To study and practice fundamental techniques in developing secure applications To understand the policy, procedures and guidelines to protect the computing resources 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> To understand security parameters and access control methods. To understand the fundamental policies and design principle of computing resources 		
<p>Components of Teaching Type: Lecture, Discussion, Case studies, observations, presentation, problem and games</p>		
<p>Unit I: Overview of Security Parameters: Confidentiality, integrity and availability; Security violation and threats; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle.</p>		
<p>Unit II: Access Control Models: Discretionary, mandatory, roll-based and task-based models, unified models, access control algebra, temporal and spatio-temporal models. Security Policies: Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, international standards.</p>		
<p>Unit III: Systems Design: Design principles, representing identity, control of access and information flow, confinement problem. Assurance: Building systems with assurance, formal methods, evaluating systems.</p>		
<p>Unit IV: Logic-based System: Malicious logic, vulnerability analysis, auditing, intrusion detection. Applications: Network security, operating system security, user security, program security. Special Topics: Data privacy, introduction to digital forensics, enterprise security specification.</p>		
<p>Unit V: Operating Systems Security: Security Architecture, Analysis of Security in Linux/Windows. Database Security: Security Architecture, Enterprise security, Database auditing.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Anderson, R. Security Engineering: A Guide to Building Dependable Distributed Systems. John Wiley & Sons, 2019. Bishop, M. Computer Security: Art and Science. Pearson Education, Boston, 2018. Stamp, M. Information security: principles and practice. John Wiley & Sons, 2014. Margulies, Jonathan., Pfleeger, Shari Lawrence., Pfleeger, Charles P. Security in Computing. 		
<p>List of Indicative Experiments</p> <ol style="list-style-type: none"> Analysis of security in Unix/Linux. Administration of users, password policies, privileges and roles Eavesdropping Attacks and its prevention using SSH Deep Packet Inspection on IP/ICMP Vulnerabilities Deep Packet Inspection on TCP/IP Vulnerabilities Implement your design using Windows Folder structure to activate directory and computer to create security groups that meets your requirement Group Policy Management to edit the default domain policy to a specific organization unit. Create new rules in Windows firewall to allow the HTTP connection and verify that the new rules allow the HTTP incoming request. Basic defensive practice skills against malicious SQL injection attacks in mobile software development. Defense of Brute Force Approach of Gaining Access MySQL Database With Weak Authentication Design a system to detect all the instances of an attack using signatures Examine network traffic and identify potentially malicious traffic 		
Total Laboratory Hours		30 hours

Subject Code MD/IC – MD-14	Subject Title SOFTWARE ENGINEERING AND AGILE SOFTWARE DEVELOPMENT WITH LAB	L T P C 3- 0- 2- 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To introduce the fundamental concepts of Software development process. 2. To teach the concepts of system analysis and design for system requirement specification, to introduce the principles of Coding, Testing, documentation and project Management 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Establish software project management activities such as planning, scheduling and Estimation for the business system. 2. Understand the business value of adopting Agile approaches and Agile development practices. 		
<p>Components of Teaching Type: Taught and Laboratory course</p>		
<p>Unit I: OVERVIEW OF SOFTWARE ENGINEERING Nature of Software, Software Engineering, Software process, project, product, Process Models Classical Evolutionary models, Introduction to Agility - Agile Process-Extreme programming - XP Process – Principles of Agile Software Development framework - Overview of System Engineering</p>		
<p>UNIT II: SOFTWARE PROCESS MODELS & PRINCIPLES Software Process Models: Waterfall, V-model, Spiral, iterative & incremental - Component-based development, Fourth Gen Techniques, Introduction to Agile Software Development, Agile Principles and Practices, Extreme Programming</p>		
<p>Unit III: SOFTWARE REQUIREMENTS ANALYSIS, DESIGN AND CONSTRUCTION Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics based control methods; measures of code and design quality.</p>		
<p>Unit IV: AGILE PROCESSES AND METHODOLOGIES Key Process Areas in CMM – Quality Improvement – Six Sigma: Six Sigma Overview, DMAIC, Lean: Lean Overview, Lean Principles, Lean Rules, Lean Implementation. Requirements for Agile approach – gathering & analysis – Designing story-boards and scrums in Agile approach - Pair Programming – Refactoring – Dynamic Systems Development (DSD) –Feature Driven Development (FDD)</p>		
<p>Unit V: SCRUM Scrum Foundations - Scrum Roles - Scrum Master - Product Owner – Team - Scrum Meetings - Scrum Artifacts - Product Backlog - Sprint Backlog - Burn-down Charts - Scaling Scrum – Manager in Scrum and Product Backlog – Principles of Agile Metrics – Release, Planning and Estimation in Scrum.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 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

Subject Code MD/IC - MD-15	Subject Title INFORMATION SYSTEM CONTROL AND AUDIT	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. This course focuses on the audit and control aspects of information systems. 2. This course emphasizes on the management control framework, data resource management controls, application control framework and processing controls 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. To understand the concepts of Audit and Control in information system. 2. To gain practical knowledge for carrying out projects in information system audit and control. 		
<p>Components of Teaching Type: Lecture, Discussion, Case studies, Assignments</p>		
<p>Unit I: Overview of Information Systems Auditing 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.</p>		
<p>Unit II: Management control structures and Audits Management Control Framework – Top Management Controls – Systems Development Management Controls–Programming Management Controls</p>		
<p>Unit III: System Control and Audits Data Resource Management Controls–Security Management Controls–Operations Management Controls–Quality Assurance Management Control</p>		
<p>Unit IV: Application Control and Audits The Application Control Framework– Boundary Controls– Input Controls- Communication Controls.</p>		
<p>Unit V: Processing Controls– Database Controls– Output Control</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. RonWeber, Information System Control and Audit, Prentice Hall, 2011 2. 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 3. Frederick Gallegos, Daniel P. Manson, Sandra Sen, and Carol Gonzales Gallegos, Information Technology Control and Audit, Auerbach Publications, 2004 4. Ed Danter, Auditing Information Systems and Controls: The only thing worse than no control is the illusion of control, Xlibris US, 2007 5. CA Chandan Patni, Information Systems Control & Audit, Taxmann Publications Pvt. Ltd., 2017. 		

MD/IC – SUMMER INTERNSHIP	MD - 16	Mini Project / Internship	0-0-8-4
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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

Subject Code Minor D/IC -MVC- 2	Subject Title DATA ANALYTICS	L T P C 0 0 4 2
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To familiarize basic concepts of Data Analytics and Python Programming To implement analytic algorithms, graphical interpretation of Data and development Intelligent Support System 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Perform data manipulation and Data Visualization Implement Machine Learning Algorithms and development of solution based on Predictive analytics 		
<p>Components of Teaching Type: Lab/Field based Learning</p>		
<p>Unit I:</p> <p>Introduction to Data Analytics:</p> <p>Introduction to Data and its significance, Introduction Data Analytics and its types - Significance of analytics in today' Business environment – Interrelation between Statistics, Analytics and Data Science - Why Python for Data Analytics.</p> <p>Python – Introduction & Essentials</p> <p>Introduction to Python Editors & IDE's (Canopy, pycharm, Jupyter, Ipython etc...) - Custom Environment Settings - Python Basic Rules in Python 3- Concept of Packages/Libraries - Important packages (NumPy, SciPy, scikit-learn, Pandas, Matplotlib, etc)- Data Types & Data objects/structures List and Dictionary Comprehensions - Variable & Value Labels– Date & Time Values - Basic Operations - Mathematical - string – date - Reading and writing data - Simple plotting/Control flow/Debugging/Code profiling.</p>		
<p>Unit II:</p> <p>Python: Data Manipulation – cleansing</p> <p>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 - Important Python Packages for data manipulation (Pandas, Numpy etc).</p>		
<p>Unit III:</p> <p>Python - Data Analysis – Visualization</p> <p>Introduction exploratory data analysis - Descriptive statistics, Frequency Tables - Univariate Analysis (Distribution of data & Graphical Analysis) - Bivariate Analysis(Cross Tabs, Distributions & Relationships, Graphical Analysis) - Creating Graphs- Important Packages for Exploratory Analysis (NumPy, arrays, Matplotlib, Pandas and scipy.stats etc)</p>		
<p>Unit IV:</p> <p>Python: Introduction to Machine learning</p> <p>Statistical learning vs. Machine learning - Iteration and evaluation - Major Classes of Learning Algorithms -Supervised vs Unsupervised - Different Phases of Predictive Modelling Concept of Overfitting and Under fitting (Bias-Variance Trade off) & Performance Metrics - Types of Cross validation (Train & Test, Bootstrapping, K-Fold validation etc)</p>		
<p>Unit V:</p> <p>Python: Predictive Modelling – Basics Introduction to Predictive Modelling - Types of Business problems - Mapping of Techniques - Linear Regression - Logistic Regression - Segmentation - Cluster Analysis - Decision Trees (CHAID/CART/CD 5.0) - Time Series Forecasting</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython 2nd Edition, 2017 Fabio Nelli, Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python, 1st edition 2015 Rudolph Russell, Machine Learning: Step-by-Step Guide To Implement Machine Learning Algorithms with Python, 2018 		

SEMESTER VII

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
Minor D/IC	EC - 1	Design Patterns / Data Warehousing and Data Mining	3-0-0-3
Minor D/IC	EC - 2	Service Oriented Architecture/ Machine Learning	3-0-0-3
Minor D/IC	EC - 3	Cyber Security and Cyber Crimes/ Deep Learning	3-0-0-3
Minor D/IC	MVG – 3	Advanced Financial Analysis and Planning	0-0-4-2
Minor D/IC	AMD -1	Security Analysis and Portfolio Management	3-0-2-4
Minor D/IC	AMD -2	MIS and ERP	3-0-0-3
Minor D/IC	AMD -3	Strategic Management	3-0-0-3
Total Credits			21

Subject Code Minor D/IC- EC-1	Subject Title DESIGN PATTERNS	L T P C 3 0 0 3
<i>Prerequisites: Knowledge in OO Concepts</i>		
Learning Objectives: <ol style="list-style-type: none"> 1. Introduction of Design Patterns and Understanding of Design Patterning and its Mining 2. Practicing of Application of Design Patterns 		
Learning Outcome: <ol style="list-style-type: none"> 1. Helps to develop software pattern 2. Helps to understand and achieve software reusability 		
Components of Teaching Type: Classroom teaching and course project		
Unit I: Introduction to Design Patterns Design Patterns Arose from Architecture and Anthropology – Architectural to Software Design Patterns – Advantages of Design Patterns – Adapter Pattern – Strategy Pattern – Bridge Pattern – Abstract Factory Pattern		
Unit II: New Paradigm of Design Principles and Strategies of Design Patterns -Open-Closed Principle – Designing from Context - Encapsulating Variation. Commonality and Variability Analysis - Analysis Matrix - Decorator Pattern - Open Closed Principle – The Principle of encapsulating variation – Abstract Classes vs Interfaces		
Unit III: Values of Patterns Observer Pattern - Categories of Patterns - Template Method Pattern – Applying the Template Method to the Case Study - Using Template Method Pattern to Reduce Redundancy		
Unit IV: Applying Design Patterns Design Patterns - Factories - Singleton Pattern and the Double- Checked Locking Pattern - Applying Singleton Pattern to Case Study. Object Pool Pattern - Management of Objects - Factory Method Pattern - Object Oriented Pool Pattern		
Unit V: Case Studies What to Expect from Design Patterns - The Pattern Community An Invitation – A Parting Thought – Banking Case Study		
Text and Reference Books: <ol style="list-style-type: none"> 1. Jason McC. Smith, Elemental design Patterns, Pearson, 2012. 2. Alan Shalloway and James R.Trott, Design Patterns explained: A new perspective on Object-Oriented Design, 2011. 3. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design Patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley, 2013. 4. Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates, Head First Design Patterns”, O'Reilly Media, Inc., 2012. 5. Elizabeth Freeman, Eric Freeman, Bert Bates and Kathy Sierra, Head First Design Patterns, O ‘Reily, 2010. 		

Subject Code Minor D/IC- EC - 1	Subject Title DATA WAREHOUSING AND DATA MINING	L T P C 3 0 0 3
Prerequisites: Fundamental concepts of DBMS		
Learning Objectives: <ol style="list-style-type: none"> 1. To explore the significance and modelling of data warehousing 2. To study data mining and its various techniques 		
Learning Outcome: On completion of the course, the students will be able to: <ol style="list-style-type: none"> 1. Enumerate a data warehouse 2. Demonstrate the pre-processing techniques and apply mining techniques on various applications 		
Components of Teaching Type: <i>Theory and Laboratory teaching</i>		
Unit I: Data Warehousing and Business Analysis Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.		
Unit: II: Data Mining Concepts Introduction to modern data analysis (Data visualization; probability; histograms; multinomial distributions), Data Mining and Knowledge Discovery in Data Bases, Data Mining Functionalities, Data Pre-processing, Data Cleaning , Data Integration and Transformation, Data Reduction , Data Discretization and Concept Hierarchy Generation, examples		
Unit III: Data Mining Algorithms: Association and Classification Association Rule Mining - Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Apriori Algorithm -Constraint-Based Association Mining. Classification and Prediction: Decision Tree. Bayesian Classification, Rule Based Classification, Support Vector Machines , Other Classification Methods.		
Unit IV: Data mining Algorithms: Clustering Cluster Analysis: - Types of Data in Cluster Analysis, Model-Based Clustering Methods, Hierarchical and Partitioning methods. Outlier Analysis.		
Unit V: Applications and trends in Data Mining Sequential Pattern Mining; Mining Text and Web data, Mining Spatiotemporal and Trajectory Patterns, Multivariate Time Series (MVTs) Mining.		
Text Books: <ol style="list-style-type: none"> 1. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, 3rd Edition, Elsevier, 2012. 2. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008. 3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007. 4. Anahory and Murray .,Data warehousing in the real world , Pearson Education / Addison Wesley. 5. Berry Micheal and Gordon Linoff, Mastering Data Mining. John Wiley & Sons Inc 		

Subject Code Minor D/IC- EC - 2	Subject Title SERVICE ORIENTED ARCHITECTURE	L T P C 3 0 0 3
Prerequisites: Basics of application development and distributed systems		
Learning Objectives: <ol style="list-style-type: none"> 1. To correlate business processes with of Service Oriented Architecture and design services based implementation respectively 2. To introduce microservices and analyse applications as microservices 		
Learning Outcome: On completion of the course, the students will be able to: <ol style="list-style-type: none"> 1. design and develop real work applications using the concepts of SOA and Web services 2. identify and implement microservices for business applications 		
Components of Teaching Type: Lecture, Discussion, Case studies, Assignments and Hands-on practice		
Unit I: Introduction SOA and MSA Basics: Service Orientation in Daily Life, Evolution of SOA and MSA. Service Oriented Architecture and Microservices architecture – Drivers for SOA, Dimensions of SOA, Conceptual Model of SOA, Standards and Guidelines for SOA, Emergence of MSA. Enterprise-Wide SOA: Considerations for Enterprise-wide SOA, Strawman Architecture for Enterprise-wide SOA, Enterprise SOA Reference Architecture, Object-oriented Analysis and Design (OOAD) Process. Service-oriented Analysis and Design (SOAD) Process, SOA Methodology for Enterprise.		
Unit: II: Service-Oriented Applications: Considerations for Service-oriented Applications, Patterns for SOA, Pattern-based Architecture for Service-oriented Applications, Composite Applications, Composite Application Programming Model. Service-Oriented Analysis and Design: Need for Models, Principles of Service Design, Nonfunctional Properties for Services, Design of Activity Services (or Business Services), Design of Data Services, Design of Client Services, Design of Business Process Services		
UnitIII: Technologies for SOA: Technologies for Service Enablement, Technologies for Service Integration, Technologies for Service Orchestration. SOA Governance and Implementation: Strategic Architecture Governance, Service Design-time Governance, Service Run-time Governance, Approach for Enterprise-wide SOA Implementation.		
Unit IV:Microservices: Microservices: Understanding Microservices, Adopting Microservices, The Microservices Way. Microservices Value Proposition: Deriving Business Value, defining a Goal-Oriented, Layered Approach, Applying the GoalOriented, Layered Approach. Designing Microservice Systems: The Systems Approach to Microservices, A Microservices Design Process, Establishing a Foundation: Goals and Principles, Platforms, Culture.		
Unit V: Service Design: Microservice Boundaries, API design for Microservices, Data and Microservices, Distributed Transactions and Sagas, Asynchronous Message-Passing and Microservices, dealing with Dependencies, System Design and Operations: Independent Deployability, More Servers, Docker and Microservices, Role of Service Discovery, Need for an API Gateway, Monitoring and Alerting. Adopting Microservices in Practice: Solution Architecture Guidance, Organizational Guidance, Culture Guidance, Tools and Process Guidance, Services Guidance		
Text Books and Reference Books: <ol style="list-style-type: none"> 1. Shankar Kambhampaty, “Service-oriented Architecture and Microservice Architecture: For Enterprise, Cloud, Big Data and Mobile”, Third Edition, Wiley, 2018. 2. Irakli Nadareishvili, Ronnie Mitra, Matt McLarty & Mike Amundsen, “Microservice Architecture - Aligning Principles, Practices, and Culture”, First Edition, Oreilly. 3. Sam Newman, Building Microservices - Designed Fine-Grained Systems, First Edition, Orielly 		

4. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.
5. Icon Group International; The 2018-2023 World Outlook for Service-Oriented Architecture (SOA) Software and Services; ICON Group International; 1st Edition, 2017

Subject Code Minor D/IC- EC - 2	Subject Title MACHINE LEARNING	L T P C 3 0 0 3
<i>Prerequisites: Basic knowledge about statistics, Linear algebra, Calculus, Probability, Programming.</i>		
Learning Objectives: 1. To understand the basic concepts of machine learning and probability theory. 2. To understand supervised and unsupervised learning techniques.		
Learning Outcome: 1. Elucidate the basic concepts of machine learning and probability theory. 2. Use supervised and unsupervised learning techniques for different types of applications.		
Components of Teaching Type: <i>Taught course</i>		
Unit I: Introduction 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.		
Unit II: Linear Discriminants – Perceptron – Linear Separability – Linear Regression - Multi Layer Perceptron – Going Forward – Going Backward - Support Vector Machine Algorithm - Decision Tree Learning – Random Forest Model.	Supervised	Learning
Unit III: K-means Algorithm –Hierarchical clustering - EM algorithm – Dimensionality Reduction Techniques - Vector Quantization – Self Organising Feature Map.	Unsupervised	Learning
Unit IV: Probabilistic Graphical Models Bayesian Networks – Conditional Independence - Markov Random Fields – Naive Bayes Classifier - Hidden Markov Model – Tracking Methods.		
Unit V: Advanced Learning Reinforcement Learning – The Learning Task – Q Learning – Temporal Difference Learning – Generalization – Relationship to Dynamic Programming - Ensemble Learning – Boosting – Bagging – Deep Learning.		
Text and Reference Books: 1. Stephen Marsland, Machine Learning – An Algorithmic Perspective, Chapman & Hall/CRC Press, Second Edition, 2013. 2. Tom M Mitchell, Machine Learning, McGraw Hill Education, First Edition, 2013. 3. Ethem Alpaydin, Introduction to Machine Learning 3E (Adaptive Computation and Machine Learning Series), MIT Press, Third Edition, 2014. 4. Miroslav Kubat, An Introduction to Machine Learning, Springer Publications, Second Edition, 2017. 5. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, Second Edition, 2017.		

Subject Code Minor D/IC- EC-3	Subject Title CYBER SECURITY AND CYBER CRIMES	L T P C 3 0 0 3
Prerequisites: Basic understanding about cyber-attacks and vulnerability.		
Learning Objectives: 1. To explore about the various cybercrimes in real world 2. To understand the importance of cyber security in banks		
Learning Outcome: On completion of the course, the students will able to: 1. Explain and understand the various cybercrimes. 2. Understand the practices of Forensic Science		
Components of Teaching Type: Taught Course		
Unit I: Introduction to Cyber Crime Nature and fundamental principles of crime – Theories of Criminal Behaviour - Cyber crimes – definition, scope and growing dimensions – Cyber Criminals and characteristic- Nature and Types of cyber crimes - Cyber Crime Techniques; Computer insecurity and computer attacks; Internet Crimes and Internet Frauds; Computer Hacking and Hackers; Social Engineering; Digital signatures and forgery.		
Unit II:	Online Attacks and Frauds	
Development in Banking Industry and Banking operations – Payment and Settlement; E-commerce, Online Banking and Crimes; Banking Software crimes, Computer Hacking – browsing, password cracking, session hijacking, man in the middle attack, Website hacking, DOS, DDoS, Source code theft - On-line banking crimes and Frauds - Spamming – Phishing - identity theft, cyber money laundering, intercepting electronic communication, Accounting frauds, forgery and counterfeiting; Vulnerability in Banks - Bank Failure and its impact on the system.		
Unit III: Cyber Forensics Introduction to Cyber Forensic Investigation, Investigation Tools, e-Discovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking.		
Unit IV: Cyber Security and Cryptography Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards and Best Practices, Assessing Threat Levels, Penetration Testing Security Controls – Preventive, Detective and Corrective controls; Forming an Incident Response Team, Reporting Cyber crime, Operating System Attacks, Application Attacks, Cryptanalytic Attacks; Reverse Engineering & Cracking Techniques - Cryptography- Encryption- Public Key Infrastructure (PKI), Key Management - IS Security and IS Audit - Global initiatives and development.		
Unit V: Laws for Cyber Security Salient features of IT Act, 2000 and latest amendments – offenses and penalties – Amendments to Indian Evidence Act, 1872 - Amendments to Indian Penal Code, 1860 - Amendments to Bankers Book of Evidence Act, 1891 - Amendments to RBI Act, 1934 - Civil and criminal liability of cyber crime - Challenges of legislative, law enforcement and justice system – Indian and International Initiatives.		
Text and Reference Books: 1. Verma Amita, Cyber Crimes and Law, Central Law Publications, 2009. 2. Dasgupta .M. , Cyber Crimes in India – A Comparative Study, Eastern Law House Publication, 2009. 3. Barkha and Mohan Rama.U., Cyber Law and Crimes – IT Act 2000 and Computer Crime Analysis, Asia Law House Publication, 2009. 4. Eoghan Casey, Digital Evidence and Computer Crime: Forensic Digital Science, Computers and the Internet, Academic Press, 2010. 5. Nelson, Phillips, Enfinger, Stuart, Computer Forensics and Investigations, Cengage Learning, 2008.		

Subject Code Minor D/IC- EC-3	Subject Title DEEP LEARNING	L T P C 3 0 0 3
Prerequisites: Machine Learning		
Learning Objectives: <ol style="list-style-type: none"> 1. To present theoretical foundations, algorithms, methodologies, and applications of neural networks and deep Learning. 2. To design and develop an application-specific deep learning models and to provide the practical knowledge to the real world applications. 		
Learning Outcome: On completion of the course, the students will able to: <ol style="list-style-type: none"> 1. Understand different methodologies to create application-specific Deep Neural Networks 2. Generate the generative models for unsupervised learning task and choose appropriate models for real world problems. 		
Components of Teaching Type: Taught courses		
Unit I: BASICS OF MACHINE LEARNING 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: INTRODUCTION TO DEEP LEARNING 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, adadelta, rmsprop, adam, NAG.		
Unit III: CONVOLUTIONAL NEURAL NETWORKS & TRANSFER LEARNING 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 Deep Learning Hardware and Software - CPUs, GPUs, TPUs, PyTorch, TensorFlow, Dynamic vs Static computation graphs, Data Preprocessing-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 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"> 1. Ian Goodfellow, YoshuaBengio and Aaron Courville, Deep Learning, MIT Press, 2017. 2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017 3. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014. 4. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" Apress, 2018. 5. Giancarlo Zaccane, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017. 		

Subject Code Minor D/IC- MVG 3	Subject Title ADVANCED FINANCIAL ANALYSIS AND PLANNING	L T P C 0-0-4-2
Learning Objectives: 1. To do the corporate Financial Analysis and practice the preparation of Financial plan 2. To prepare and demonstrate Dashboard		
Learning Outcome: On completion of the course, the students will able to: 1. Apply appropriate techniques to derive meaningful conclusion from the data 2. Apply appropriate tools to Analyse the Company Financial Data		
Components of Teaching Type: Taught Course		
Unit I: Corporate Financial Analysis and Planning using SPREAD SHEET		
Unit II: Data visualisation and preparation of various charts using RAWGRAPHS		
Unit III: Data visualisation and preparation of various charts using GOOGLE CHARTS		
Unit IV: Data Visualisation and Dashboard creation using POWER BI		
Unit V: Data Visualisation and Dashboard creation using TABLEAU		
Text Books: 1. Wexler, Steve., Shaffer, Jeffrey., Cotgreave, Andy. The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios. Germany: Wiley, 2017. 2. Russo, Marco., Ferrari, Alberto. Analyzing Data with Microsoft Power BI and Power Pivot for Excel. United States: Microsoft Press, 2017.		

Subject Code Minor D/IC-AMD-1	Subject Title SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	L T P C 3 0 2 4
Learning Objectives: 1. To provide basics of investment analysis, fundamental and technical analysis about the companies and stock market. 2. To impart the knowledge and skills to value and price the equity stocks using different models.		
Learning Outcomes: 1. Students will be able to analyse equity stocks by estimating risk and return 2. Students will be capable analysing the companies through fundamental analysis		
Components of Teaching Type: Lecture, problem solving, case study discussion		
Unit I: Basics of Investment 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 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 Meaning–Importance–Objectives–Analysis Economic, Industry, and Company–Financial and Non-Financial Parameters–Technical Analysis: Meaning–Difference between fundamental analysis and Technical analysis- The Dow Theory–Technical indicators–Charting Techniques–Stock market indicators– Market Efficiency: Weak form– Semi-strong form– Strong form– valuation equity.		
Unit IV: Portfolio Analysis 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 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: <ol style="list-style-type: none"> 1. Fisher & Jordan, “Portfolio Management”, Prentice Hall, New York, 2012 2. Reilly Brown, Investment Analysis and Portfolio Management, Cengage Learning 8th 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. 5. Alexander, Gordon J and Sharpe, William F., “Fundamentals of Investment” Englewood Cliffs, New Jersey, Prentice Hall Inc, 2004. 		

Subject Code Minor D/IC- AMD-2	Subject Title MANAGEMENT INFORMATION SYSTEM AND ENTERPRISE RESOURCE PLANNING	L T P C 3-0-0-3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To examine the basic concepts of information system 2. To illustrate the information system applications in business functions 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Examine the latest Information system tools and the latest concepts of Management Information System 2. Apply and experiment system development methods for the implementation of enterprise information system 		
<p>Components of Teaching Type: Taught course</p>		
<p>Unit I: Introduction to MIS</p> <p>Business Data, Information and Knowledge – Information System – Process - Management Information System -Role and Importance of Management Information System in the competitive business environment – Business Applications of MIS.</p>		
<p>Unit II: Types of Information system</p> <p>Transaction Processing System – Office Automation - Electronic Data Processing System – Decision Support system – Structured and unstructured Decision making System - Expert System – Knowledge Based System – Artificial Intelligent System</p>		
<p>Unit III: Information system Analysis and Design</p> <p>System analysis and Design – Stages of SDLC – Feasibility study – System study – System Design – Resource utilisation – Implementation – Maintenance and Modification – System Audit</p>		
<p>Unit IV: Functional Information System</p> <p>Production / Operation Information system – Financial Information system – Marketing Information System – HR Information System - Information system Values and Effectiveness</p>		
<p>Unit V: Enterprise Resource Planning</p> <p>ERP System – Types of ERP – Difference between MIS and ERP – ERP Implementation – Process Mapping – Cloud ERP.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. O'Brien, James A., Marakas, George M.. Management Information Systems. United Kingdom: McGraw-Hill/Irwin, 2011. 2. Laudon, Kenneth C., Laudon, Jane P.. Management Information Systems: Managing the Digital Firm. United States: Pearson Education, 2013. 3. Alexis Leon and Mathew Leon. Fundamentals Of Information Technology, 2E. India: Vikas Publishing House Pvt Limited, 2009. 		

Subject Code Minor D/IC- AMD-3	Subject Title STRATEGIC MANAGEMENT	L T P C 3-0-0-3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To make the students understand the strategic management process 2. To help the students to identify and link the strategy formulation 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. To gain knowledge to develop learning and analytical skills to solve the business cases. 2. To acquire practical knowledge to deal with strategic decision-making process 		
<p>Components of Teaching Type: Lecture, Discussion, Case studies, observations, presentation, role plays, problem and games</p>		
<p>Unit-I: Introduction to Strategy: 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>		
<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>		
<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’s 7s Framework - Business Level Strategies- Michael Porter’s Generic strategies, Functional level strategies.</p>		
<p>Unit-IV: Strategy Implementation: 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>		
<p>Unit-V: Strategy Evaluation and Control – Establishing strategic controls - Operations Control and Strategic Control - Measuring performance – Qualitative and quantitative benchmark - Analyzing variances - Strategic information systems – Strategic surveillance -strategic audit.</p>		
<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. Hitt, Michael A. Ireland., Manikutty, S.. Strategic Management: a South-Asian Perspective (with CourseMate). India: Cengage South-Western, 2015. 		

SEMESTER VIII

PU_NEP_COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
Minor D/IC	AMD – 4	Blockchain and Cryptocurrencies	3-0-0-3
Minor D/IC	AMD – 5	Big Data and Cloud Computing	3-0-2-4
Research	AMD – 6	Project Work / Internship	0-0-30-3
Dissertation	AMD – 7	Project Report	3
Project	AMD – 8	Project Presentation	3
	AMD – 9	Project Viva	3
	AMD - 10	Project Evaluation	3
Total Credits			22

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 Minor D/IC- AMD - 4	Subject Title BLOCKCHAIN AND CRYPTOCURRENCIES	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To understand the basic concepts of Blockchain Technology, Cryptocurrency, cryptographic algorithms. To gain knowledge about various operations associated with the life cycle of Blockchain and Cryptocurrency 		
<p>Learning Outcome: On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Understand and apply the fundamentals of Cryptography in Cryptocurrency Gain basic understanding in principles, practices and policies associated with Bitcoin business and synthesize the implementation of Blockchain Technology in real world problems. 		
<p>Components of Teaching Type: Classroom based Learning/Lab Assignments</p>		
<p>Unit I: Introduction to Cryptography and Cryptocurrencies. Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency.</p>		
<p>Unit II: Introduction to Blockchain Technology Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus with- out identity using a blockchain, Incentives and proof of work. Recent Trends and applications</p>		
<p>Unit III: Storage and Mechanics of Bitcoin Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges Payment Services, Currency Exchange Markets. Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bit- coin network, Limitations and improvements.</p>		
<p>Unit IV: Bitcoin Mining and Anonymity The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives, Transaction Fees and strategies - Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash.</p>		
<p>Unit V: Altcoins and the Cryptocurrency Ecosystem Altcoins: History and Motivation, A Few Altcoins in Detail, Relationship Between Bitcoin and Altcoins, Merge Mining-Atomic Crosschain Swaps-6 BitcoinBacked Altcoins, Side Chains, Ethereum and Smart Contracts.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. Imran Bashir, Mastering Blockchain, Second Edition, Packt Publication, 2018 Antonopoulos, A. M. <i>Mastering Bitcoin: unlocking digital cryptocurrencies.</i> O'Reilly Media, Inc.", 2014 Franco, P. <i>Understanding Bitcoin: Cryptography, engineering and economics.</i> John, Wiley and Sons.2014 		

Subject Code Minor D/IC-- AMD 5	Subject Title BIG DATA AND CLOUD COMPUTING	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To understand the computational approaches to big data analytics and the various search methods and visualization techniques 2. To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Understand core technical concepts related to Business Intelligence, Big Data Analytics along with Hadoop Architecture for business applications. 2. Identify the architecture and infrastructure of cloud computing, and to provide the appropriate cloud computing solutions and recommendations according to the applications used. 		
<p>Components of Teaching Type: Classroom based teaching / lab assignments</p>		
<p>Unit I: Introduction To Big Data Mining Data Streams</p> <p>Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting. Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions</p>		
<p>Unit II: HADOOP and Spark</p> <p>History of Hadoop- the 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-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features Hadoop environment. Spark.</p>		
<p>Unit III: FRAMEWORKS</p> <p>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</p>		
<p>Unit IV: Introduction To Cloud Computing</p> <p>Introduction to Cloud Computing- Cloud issues and challenges - 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 (HA)/Disaster Recovery (DR) using Virtualization, Moving VMs .</p>		
<p>Unit V: Cloud Computing Applications Governance And The Future Of Cloud:</p> <p>Cloud Programming and Software Environments – Parallel and Distributed Programming paradigms – Overview on Amazon AWS and Microsoft Azure – Overview on 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, How Cloud Will Change Operating Systems, Future of Cloud TV & Cloud-Based Smart Devices, Cloud and Mobile, Home-Based Cloud Computing.</p>		
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> 1. Comer, Douglas. The Cloud Computing Book: The Future of Computing Explained. United Kingdom: CRC Press, 2021. 		

2. 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. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.

Research Dissertation Project:**15 CREDITS****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

M.B.A – BANKING TECHNOLOGY**SEMESTER IX**

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
		Banking Technology Management	3-0-2-4
		Banking Operations Management	3-0-0-3
		Risk Management in Banks	3-0-0-3
		International Banking and Forex Trade	3-0-2-4
		Business Intelligence in Banking	3-0-0-3
		Digital Transformation for Banks	3-0-0-3
		Digital Assets Management	3-0-0-3
Total Credits			23

Subject Code	Subject Title BANKING TECHNOLOGY MANAGEMENT	L T P C 3-0-2-3
Learning Objectives: 1. To understand Core Banking and the Technologies involved. 2. To learn Banking Channels and Payments gateways.		
Learning Outcome: 1. To gain knowledge about CBS components and other banking software. 2. To acquire practical knowledge of Banking Technology		
Components of Teaching Type: Theory and Laboratory based Teaching		
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.		
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.		
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.		
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.		
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.		
Text and Reference Books: 1. Kaptan SS & Choubey NS., 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 5. David, Hanes and Salgueiro Gonzalo, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Pearson, 2017		
Laboratory Exercises: Design and Develop the Banking Software Prototypes with the following functionalities using the appropriate technologies: <ul style="list-style-type: none"> ● Mobile and Internet Banking Functions ● ATM Functions and Banking Middleware Functions 		

Subject Code	Subject Title BANKING OPERATIONS AND MANAGEMENT	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To expose various functional aspects of commercial banks in India To introduce the overview of management of commercial Banks in India 		
<p>Learning Outcome: On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> To gain the knowledge on various aspects of guidelines governing Indian Banks To acquire the practical knowledge and understanding of bank and branch operations. 		
<p>Components of Teaching Type: Lecture, Discussion, Case studies, Presentation, Role plays, Management games</p>		
<p>Unit- I: Introduction: 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.</p>		
<p>Unit- II: Operational Aspect of Commercial Banks: 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.</p>		
<p>Unit- III: Lending of Loans and Advances: 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.</p>		
<p>Unit- IV: Securities and Modes of Charges: General principles - Secured Vs. unsecured - Collateral securities - Advances against tile of goods/ ornaments/ securities/ book debts etc., Modes of Charges: lean/pledge/ hypothecation and mortgages – Guarantees and surety - Documentation procedures and Stamping</p>		
<p>Unit –V: Prudential Norms: 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.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> IIBF, Advanced Bank Management, 3rd Edition, MacMillan Education. 2015 IIBF, Bank Financial Management, 3rd Edition, MacMillan Education. 2015 W.Koch, S.Scott Mac Donald Timothy, Bank Management, 8th Edition, Cengage Learning John a.Haslem, Banks Fund Management, Pearson Education. Bimal Jaiswal, Banking Operation Management, Vikas publishing house, 2015. Johannes Wernz, Bank Management and Control, 2nd Edition, 2020. H.R. Gupta, Practical Banking In India, Gyan Publishing House, 2011 Kris Jamsa, Cloud Computing, Jones & Bartlett Learning, 2013 		

9. Kumar Saurabh, Cloud Computing – Insights into new era infrastructure, Wiley India, 2nd Edition, 2012
10. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, Second Edition, 2007.
11. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.

Subject Code	Subject Title RISK MANAGEMENT IN BANK	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To understand the basic concept of risk management in banks 2. To expose the various types of risk faced by banks 		
<p>Learning Outcome: On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. To understand and appreciate the concepts of Risk/ Return Tradeoffs. 2. To acquire required knowledge and demonstrate skills sets required for Credit Risk Management. 		
<p>Components of Teaching Type: Exercise, Case studies, Assignments and mini projects</p>		
<p>Unit I: Introduction and Overview: 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>		
<p>Unit II: Credit Risk: 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>		
<p>Unit III: Operational Risk: 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>		
<p>Unit IV: Market risk: 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>		
<p>Unit V: Risk Measurement, Control and Management: 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>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. 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 		

Subject Code	INTERNATIONAL BANKING AND FOREX TRADE	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1.To understand the structure of Global Financial Systems 2. To learn about the Euro currency transactions & the role played by International FIs 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. To understand the structure of Global Financial Systems 2. To learn about the Euro currency transactions & the role played by International FIs 		
<p>Components of Teaching Type:</p> <p>Methodology: Exercise, Case studies, Assignments and mini projects</p>		
<p>Unit I:</p> <p>International Banking: 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>Unit II:</p> <p>Global Business Environment :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>Unit III:</p> <p>The Foreign Exchange Market: 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>Unit IV:</p> <p>International Banking, Legal And Regulatory Aspects : 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 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.</p>		
<p>Unit V:</p> <p>International Banking Operations: 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.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. A.W. Mullineux& Victor Murinde.Handbook of International Banking. Edward Elgar,2003. 		

2. **CheolEun& Bruce G. Resnick. International Financial Management, McGraw Hill,2012.**
3. **Indian Institute of Banking & Finance. International Banking Operations. Macmillan Publishers,2007.**
4. Jane Hughes & Scott MacDonald. (2002). International Banking: Text and Cases,2002.
5. Ian H Giddy, "Global Financial Markets", AITBS Pub, Delhi 11 051.

Subject Code	Subject Title BUSINESS INTELLIGENCE IN BANKING	L T P C 3 0 0 3
Learning Objectives: <ol style="list-style-type: none"> 1. To understand data extraction, transformation and loading process 2. To understand how knowledge discovering process is used in business decision making 		
Learning Outcome: On completion of the course, the students will able to: <ol style="list-style-type: none"> 1. Learn to apply various data mining techniques into various areas of different domains. 2. Apply various prediction techniques, supervised and unsupervised learning techniques 		
Components of Teaching Type: Classroom based learning / Lab assignments		
Unit I: Introduction Business Intelligence Introduction, Framework of Business Intelligence- Definition, History, Architecture of BI, benefits of BI, Intelligence creation and use of BI governance, Transaction processing versus analytic processing, BI implementation – Developing or acquiring BI, Justification and Cost-benefit analysis, Security and protection of privacy, Integration of systems and applications, BI tools and techniques.		
Unit II: Data Warehousing – ETL Data Warehousing – Definition, and concepts, Characteristics, Data marts, Operational data stores, Enterprise data warehouse, metadata, Architectures. Data warehouse process overview. Data integration, ELT. Data warehouse development – Vendors, Development approaches, Representation of data in data warehouse, OLAP Vs OLTP, OLAP operations Implementation issues of data warehouse, Administration, security and future trends of data warehouse.		
Unit III: Data Mining Process Data preprocessing: Data Cleaning, Data Transformation, Feature Selection, Dimensionality Reduction, Regression, Multiple Regression & Model building, Discretization and Generating Concept Hierarchies – UCI repository of Dataset		
Unit IV: Association rule mining Mining Frequent Patterns, Associations and Correlation: Market-Basket Analysis – Apriori Algorithm, Frequent Itemset Mining Methods, Frequent Itemsets to Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining – Multidimensional Association		
Unit V: Classification and Clustering: 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 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		
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.

Subject Code	Subject Title DIGITAL TRANSFORMATION FOR BANKS	L T P C 3 0 0 3
<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> <ol style="list-style-type: none"> Describe the underlying economics of innovation, technology, and market disruptions. Apply skills to incorporate digital disruption in business planning capabilities and implement digital transformation. 		
<p>Components of Teaching Type: Lecture, Discussion, Case studies, Assignments and Hands-on practice</p>		
<p>Unit I -Digital Disruption and Digital Transformation Imperative 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>		
<p>Unit II -Leadership and Management of Digital Transformation 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>		
<p>Unit III - Understanding Digital Business Capabilities 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>		
<p>Unit IV - Understanding Digital Technologies – Data science and IoT 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>		
<p>Unit V- Understanding Digital Technologies - Contemporary and Communication Technologies 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>		
<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. Industry 4.0: managing the digital transformation, Ustundag, Alp, and Emre Cevikcan. Springer Nature, 2018. Driving Digital: The Leader's Guide to Business Transformation Through Technology 		

Subject Code	Subject Title DIGITAL ASSETS MANAGEMENT	L T P C 3-0-0-3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To illustrate the concept of Digital Assets and Management 2. To relate the concept of Digital and Crypto Currency system for business applications 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Evaluate Different Digital Currency and Digital Assets 2. Appraise the Digital Assets Trading system 		
<p>Components of Teaching Type: Taught Course</p>		
<p>Unit I: Digital Assets and De-Fi</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>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>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 – Loopring wallet</p>		
<p>Unit IV: NFT and WEB3</p> <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>		
<p>Unit V: Dematerialisation and DAM Software</p> <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 Softwares – IBM’s DAM solutions.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Harvey, Campbell R., Ramachandran, Ashwin., Santoro, Joey. DeFi and the Future of Finance. United Kingdom: Wiley, 2021. 		

2. **Dave Shamrock And Justin Sonnen, Decentralized Finance (DeFi) & Metaverse For Beginners 2 Books in 1 2022: The #1 Guide On Investing In Cryptocurrency, Bitcoin, Ethereum, Smart Contracts, Blockchain Gaming, Virtual Reality, NFT. N.p.: Dave Shamrock, 2022.**
3. Dhuddu, Rajesh., Mahankali, Srinivas. Blockchain A to Z Explained: Become a Blockchain Pro with 400+ Terms (English Edition). India: BPB Publications, 2021.

SEMESTER X

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
		Critical Thinking and Problem Identification / Research Methodology	3-1-0-4
		Internship / Research Project	0-0-36-10
		Industry / Expert Evaluation	2
		Documentation and Reporting	2
		Presentation	2
		Viva	2
Total Credits			22

Subject Code	Subject Title CRITICAL THINKING AND PROBLEM IDENTIFICATION	L T P C 3-1-0-4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To evaluate the concept of Critical thinking 2. To determine the fundamentals Problem solving 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Appraise Critical Thinking and Identify the real life problems 2. Create solutions for the problems 		
<p>Components of Teaching Type: Taught Course</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>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>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>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>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>Text Books:</p> <ol style="list-style-type: none"> 1. Paul, Richard., Elder, Linda. Critical Thinking: Tools for Taking Charge of Your Learning and Your Life. N.p.: Vital Source (for Pearson) VST E+p, 2015. 2. Fisher, Alec. Critical Thinking: An Introduction. United Kingdom: Cambridge University Press, 2011. 3. Thomson, Anne. Critical Reasoning: A Practical Introduction. United Kingdom: Routledge, 2001. 4. Krulik, Stephen., Rudnick, Jesse A.. Problem solving A Hand Book for Teachers. N.p.: Allyn and Bacon. 1982. 		

Subject Code	Subject Title RESEARCH METHODOLOGY	L T P C 3-1-0-4
Learning 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.		
Learning Outcomes: 1. Applying the research methods in business application 2. Employing research methods, tools, and techniques to find solutions for complex problems in business and academic research.		
Components of Teaching Type: Lecture, Problem Solving, and Case Study Analysis		
Unit I Introduction to Research		
Science and Research: 1. Definition – History – Evolution of Scientific Inquiry, Scientific Research: Definition, Characteristics, types, need of research. Research Design.		
Unit II Research Methodology and Design		
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		
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		
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		
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:		
<ol style="list-style-type: none"> 1. Kothari, C. R.. Research Methodology: Methods and Techniques. India: New Age International (P) Limited, 2004. 2. Garg, Bhanwar Lal. Introduction To Research Methodology. India: RBSA Publishers, 2002. 3. Gupta, S. P. Statistical Methods. India: Sultan Chand & Sons, 2011. 4. Levin. Richard. I and Rubin. David. S ‘Statistics for Management’ Prentice-Hall, 8th Edition. 2017 		

5. R.Pannerselvam, "Research Methodology" Kindle Edition, 2013

Subject Code	Subject Title RESEARCH PROJECT WORK	Subject Type & Credit Hard 10 Credits
<p>The Final Research/Internship Project has two Phases.</p> <p>Phase I: 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: 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	Subject Title Documentation and Reporting	Subject Type & Credit Hard 2 Credits
<p>Students should submit a draft of the Research/Industry Project Report by the First week of April.</p> <p>Final Project Report must contain the following Components: (75-100 Pages)</p> <ol style="list-style-type: none"> 1. Title Page (Soft Binding) 2. 4- 5Chapters (Back ground work, Methodology/Algorithm/Mathematical Model) 3. The final project report should be prepared by following the template provided by the department. 		

Subject Code	Subject Title Project Viva Voce	Subject Type & Credit Hard 6 Credits
<p>Research/ Industry Project work will be evaluated by two external examiners in a public presentation and a viva voce.</p>		

M.B.A – FINANCIAL TECHNOLOGY**SEMESTER IX**

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
		Financial Technology Management	3-0-2-4
		Digital Business Models	3-0-0-3
		Entrepreneurship in Fintech	3-0-0-3
		Project Planning and Financing	3-0-0-3
		Applied Financial Analytics	2-0-2-3
		International Finance and Forex Trade	3-0-2-4
		Business Intelligence	2-0-2-3
Total Credits			23

Subject Code	Subject Title FINANCIAL TECHNOLOGY MANAGEMENT	L T P C 3- 0- 2- 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Major areas in FinTech, including Money and Payment, Digital Finance and Alternative Finance 2. FinTech Regulation and RegTech, Role of Data and Security in data-driven finance 		
<p>Learning Outcomes:</p> <ol style="list-style-type: none"> 1. Knowledge in FinTech, Digital finance and RegTech 2. Analyse and evaluate what is driving technology innovation in Finance 		
<p>Components of Teaching Type: Theory and Laboratory based Teaching</p>		
<p>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.</p>		
<p>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.</p>		
<p>Unit III: Digital Finance and Alternative Finance Introduction – Brief History of Financial Innovation – Digitization of Financial Services - FinTech & Funds- Crowd funding– Regards, Charity and Equity - P2P and Marketplace Lending – New Models and New Products – ICO.</p>		
<p>Unit IV: FinTech Regulation and RegTech Introduction - 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.</p>		
<p>Unit V: Data & Tech Introduction - History of 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.</p>		
<p>Text and Reference Books:</p> <ol style="list-style-type: none"> 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 		
<p>Laboratory Exercises: Design and Develop the Financial Software Prototypes with the following functionalities using the appropriate technologies:</p> <ul style="list-style-type: none"> ● Micro Finance Functions including Digital Payment and Blockchain based Secured Payment ● RegTech 		

Subject Code	Subject Title DIGITAL BUSINESS MODELS	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To impart the digital transformation and stages To impart digital emerging business models 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Understand Various digital developments Develop Digital business model and apply 		
<p>Components of Teaching Type: Taught courses</p>		
<p>UNIT I: INTRODUCTION TO DIGITAL TRANSFORMATION: 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</p>		
<p>UNIT II: PLATFORMS IN A DIGITAL ECONOMY: - 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</p>		
<p>UNIT III DIGITAL BUSINESS MODELS: 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</p>		
<p>UNIT IV ORGANISATION STRUCTURE AND LEADERSHIP ROLES: 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</p>		
<p>UNIT V: DIGITAL BUSINESS STRATEGY: Data-Driven Framework - Digital Operations- Digital competitive advantage -strategy for the digital consumer journey- Data and Technology Driven Marketing- Agile Marketing- AI-powered Marketing</p>		
<p>Text Books:</p> <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. 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. 		

Subject Code	Subject Title ENTREPRENEURSHIP IN FINTECH	L T P C 3 0 0 3
<p>Learning Objectives:</p> <ol style="list-style-type: none"> To impart knowledge on FinTech developments To impart business development process for FinTech ideas 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> Understand FinTech ecosystem Develop FinTech business model 		
<p>Components of Teaching Type: Taught courses</p>		
<p>UNIT I: INTRODUCTION AND THE FINTECH REVOLUTION: 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>		
<p>UNIT II: ECONOMIC & REGULATORY FOUNDATIONS OF FINTECH: 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>		
<p>UNIT III: THE FINTECH ECOSYSTEM: 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>		
<p>UNIT IV: FINTECH IDEA EXECUTION & STRATEGIES: 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>		
<p>UNIT V: FINTECH PROJECT: Final Project/Prototype</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> Phadke, Sanjay. FinTech Future: The Digital DNA of Finance. India: SAGE Publications, Incorporated, 2020. Disrupting Finance: FinTech and Strategy in the 21st Century. Germany: Springer International Publishing, 2018. Swanson, Seth. FinTech for Beginners: For Beginners! Understanding and Utilizing the Power of Financial Technology. N.p.: CreateSpace Independent Publishing Platform, 2016. Financial Technology (FinTech), Entrepreneurship, and Business Development: Proceedings of The International Conference on Business and Technology (ICBT 2021). Switzerland: Springer International Publishing, 2022. 		

Subject Code	Subject Title PROJECT PLANNING AND FINANCING	L T P C 3 0 0 3
Learning Objectives: 1. To understand the resources, schedules, risks, and scope to produce a desired outcome of a project 2. To making the student learn the tools and techniques for effective planning and management of projects		
Learning Outcome: On completion of the course, the students will able to: 1. Prepare project plan by applying the concepts of project management 2. Organize and manage the resources of projects, evaluate the sources of finance and mitigate risks		
Components of Teaching Type: <i>Taught Course</i>		
Unit I: Introduction - Project planning – scheduling – controlling - Role of decision in project management - 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. Teamwork in Project Management: Formation of Effective teams.		
Unit II: Project Planning: Project Planning and Scheduling techniques - project planning to project completion: 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: Phase of project audit Project closure reports - e-markets in Project Management		
Unit III: Project Finance: 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 - 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 - Legal Aspects in Project Finance - Project Agreements - Sub-Contracts and Other Related Agreements - Project Finance Loan Documentation - Contemporary Issues in Project Finance		
Text Books: 1. Chandra, Prasanna. Projects: Planning, Analysis, Selection, Financing, Implementation and Review. India: Tata Mcgraw-Hill, 2002. 2. Samnel.J.Montel, Jack.R.Meredith an Scott.M.Shafer Margaret .M.sutton with M.R.Gopalan”, Project Management,1st edition, Wiley India, 2006. 3. PaneerSelvam, R., and Senthilkumar, P., Project Management, PHI, 2011.		

Subject Code	Subject Title APPLIED FINANCIAL ANALYTICS	L T P C 2-0-2-3
Learning Objectives: <ol style="list-style-type: none"> To inculcate the significance of data analysis in the minds of the students. To make the students understand the advanced econometric modelling so as to be used for the decision making process. 		
Learning Outcomes: <ol style="list-style-type: none"> Students will be able to understand importance of data analysis Students can apply different econometric modelling 		
Components of Teaching Type: <i>Lecture, Problem Solving, and Discussion of Research Papers.</i>		
Unit I Introduction to Data and Econometrics Steps in Empirical Economic Analysis – Structure of Economic Data – Causality and the Notion of Ceteris Paribus in Econometric Analysis.		
Unit II Time series Modeling 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 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 Motivations- Historical Volatility – Implied Volatility – ARCH Models – GARCH – EGARCH- MGARCH Models.		
Unit V Panel Data methods 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"> Wooldridge, Jeffrey M.. Introductory Econometrics: A Modern Approach. Brazil: Cengage Learning, 2020. Gujarati, Damodar N.. Basic Econometrics. India: McGraw Hill, 2003. Brooks, Chris. Introductory Econometrics for Finance. United Kingdom: Cambridge University Press, 2008. Hair, Joseph F., Black, William C., Babin, Barry J., Anderson, Rolph E.. Multivariate Data Analysis. United Kingdom: Pearson, 2013. 		

Subject Code	INTERNATIONAL FINANCE AND FOREX TRADE	L T P C 3 0 2 4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To introduce the basic concepts of international financial system, institutions involved, instruments traded and the nature of short term and long term markets operate in it. 2. To highlight the role and functioning of different international financial institutions facilitating the working of global financial markets. 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Helps the students to work in the global financial consultancy firms 2. To acquire practical knowledge and understanding in global financial markets and trade 		
<p>Components of Teaching Type:Lecture, Discussion, Case studies, observations, presentation, role plays, problem and games</p>		
<p>Unit I:</p> <p>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.</p>		
<p>Unit II:</p> <p>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.</p>		
<p>Unit III:</p> <p>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.</p>		
<p>Unit IV:</p> <p>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.</p>		
<p>Unit V:</p> <p>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.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1.Ross P. Buckley, Douglas Arner, “From Crisis to Crisis, The global Financial System and Regulatory Failure”, Kluwer Law International, ISBN 9789041133540, vol 14,2011. 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”, Palgrave Macmillan UK,2013. 4.George W. McKenzie, “The Economics of the Euro-Currency System”, Macmillan Publishers Limited,1976. 		

Subject Code	Subject Title BUSINESS INTELLIGENCE	L T P C 2 0 2 3
Learning Objectives: 1. To learn the fundamentals of Business Intelligence. 2. To learn the advanced concepts in BI, Data warehouse, Data Mining Technologies.		
Learning Outcomes: 1. Knowledge in Business intelligence. 2. Developing Data warehouse and Data Mining Techniques in various applications		
Components of Teaching Type: Theory and Laboratory based Teaching		
Unit I: Business Intelligence 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 – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Clean-up, and Transformation Tools –Metadata – reporting – Query tools and Applications – OLAP -- Interface of BI with organization capability		
Unit II: Knowledge Discovery Data Mining: - Data Mining Functionalities – Data Pre-processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – 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.		
Unit III: Classification and Prediction Issues Regarding Classification and Prediction – 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.		
Unit IV: Cluster Analysis Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based 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.		
Unit V: Other Decision Supporting Technologies 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.		
Text and Reference Books: 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.		

5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education, 2007.

Laboratory Exercises: Design and Develop the BI Prototypes with the following functionalities using the appropriate technologies:

- Defining Business Requirements: Dimensional Analysis, Developing Information Packages, Requirements Definition
- Architecture and Infrastructure Specification: Metadata definition, Multi-Dimensional Modelling: Star Schema and Snow Flake Schema
- Extraction, Transformation and Loading: Defining rules for ETL, Usage of ETL Tools
- Information Delivery– OLAP, ROLAP and MOLAP
- Data Mining–Usage of Data Mining Tools

SEMESTER X

PU_NEP_ COMPONENT	AICTE COMP.	COURSE TITLE	L-T-P-C
		Critical Thinking and Problem Identification / Research Methodology	3-1-0-4
		Internship / Research Project	0-0-36-10
		Industry / Expert Evaluation	2
		Documentation and Reporting	2
		Presentation	2
		Viva	2
Total Credits			22

Subject Code	Subject Title CRITICAL THINKING AND PROBLEM IDENTIFICATION	L T P C 3-1-0-4
<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. To evaluate the concept of Critical thinking 2. To choose the methods of implementing Critical thinking during the Internship 		
<p>Learning Outcome:</p> <p>On completion of the course, the students will able to:</p> <ol style="list-style-type: none"> 1. Appraise Critical Thinking and Identify the real life problems 2. Evaluate technical solutions for the problems 		
<p>Components of Teaching Type: Taught Course</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>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>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>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>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>Text Books:</p> <ol style="list-style-type: none"> 1. Paul, Richard., Elder, Linda. Critical Thinking: Tools for Taking Charge of Your Learning and Your Life. N.p.: Vital Source (for Pearson) VST E+p, 2015. 2. Fisher, Alec. Critical Thinking: An Introduction. United Kingdom: Cambridge University Press, 2011. 3. Thomson, Anne. Critical Reasoning: A Practical Introduction. United Kingdom: Routledge, 2001. 4. Krulik, Stephen., Rudnick, Jesse A.. Problem solving A Hand Book for Teachers. N.p.: Allyn and Bacon. 1982. Fisher, A. E. Critical Thinking: An Introduction. Cambridge: Cup. 		

Subject Code	Subject Title RESEARCH METHODOLOGY	L T P C 3-1-0-4
Learning Objectives: 3. To introduce the basic concepts of Research Methodology 4. To impart the knowledge and improve the skills to apply research methods in business.		
Learning Outcomes: 3. Applying the research methods in business application 4. Employing research methods, tools, and techniques to find solutions for complex problems in business and academic research.		
Components of Teaching Type: Lecture, Problem Solving, and Case Study Analysis		
Unit I Introduction to Research Science and Research: 1. Definition – History – Evolution of Scientific Inquiry, Scientific Research: Definition, Characteristics, types, need of research. Research Design.		
Unit II Research Methodology and Design 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 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 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 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. Garg, Bhanwar Lal. Introduction To Research Methodology. India: RBSA Publishers, 2002.		

3. **Gupta, S. P. Statistical Methods. India: Sultan Chand & Sons, 2011.**
4. Levin. Richard. I and Rubin. David. S 'Statistics for Management' Prentice-Hall, 8th Edition. 2017
5. R.Pannerselvam, "Research Methodology" Kindle Edition, 2013

Subject Code	Subject Title Project Work	Subject Type & Credit Hard 10 Credits
<p>The Final Research/Internship Project has two Phases.</p> <p>Phase I: 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: 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	Subject Title Documentation and Reporting	Subject Type & Credit Hard 2 Credits
<p>Students should submit a draft of the Research/Industry Project Report by the First week of April.</p> <p>Final Project Report must contain the following Components: (75-100 Pages)</p> <ol style="list-style-type: none"> 1. Title Page (Soft Binding) 2. 4- 5Chapters (Back ground work, Methodology/Algorithm/Mathematical Model) 3. The final project report should be prepared by following the template provided by the department. 		

Subject Code	Subject Title Project Viva Voce	Subject Type & Credit Hard 6 Credits
<p>Research/ Industry Project work will be evaluated by two external examiners in a public presentation and a viva voce.</p>		