VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B. Tech in Computer Science and Business Systems

Scheme of Teaching and Examination (2018)

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2019 –20)

III SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	18MAT31	Transform Calculus, Fourier Series and Numerical Techniques	Mathematics	2	2	--	03	40	60	100	3
2	PCC	18CS32	Data Structures and Applications	CB/CS / IS	3	2	--	03	40	60	100	4
3	SH	18CB33	Business Communication and Value Science - I	CB/CS / IS	3	0	--	03	40	60	100	3
4	PCC	18CB34	Computer Organization	CB/CS / IS	3	0	--	03	40	60	100	3
5	PCC	18CB35	Operating Systems	CB/CS / IS	3	0	--	03	40	60	100	3
6	PCC	18CB36	Discrete Mathematical Structures	CB/CS / IS	3	0	--	03	40	60	100	3
7	SH	18CBL37	Operating Systems Laboratory	CB/CS / IS	--	2	2	03	40	60	100	2
8	PCC	18CSL38	Data Structures Laboratory	CB/CS / IS	--	2	2	03	40	60	100	2
9	HSMC	18KSK39	Samskrutika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	1
		18KBK39	Balake Kannada (Kannada for Administration)									
		OR	**OR**									
		18CPH39	Constitution of India, Professional Ethics and Cyber Law		1	--	--	02	40	60		
					Examination is by objective type questions							
				TOTAL	**17**	**10**	**04**	**24**	**420**	**480**	**900**	**24**
					OR	OR		OR	OR	OR		
					18	**08**		**26**	**360**	**540**	**900**	**24**

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course

18KAK39 Samskrutika Kannada (Kannada for communication) is for non-Kannada speaking, reading, and writing students and **18KVK39** Balake Kannada (Kannada for Administration) is for students who speak, read and write Kannada.

The course prescribed to lateral entry Diploma holders admitted to III semesters of Engineering programs

10	NCMC	18MATDIP31	Additional Mathematics - I	Mathematics	02	01	--	03	40	60	100	0

(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semesters of BE/B.Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum of 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear forSEE.

(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award ofthedegree

Courses prescribed to lateral entry B. Sc. degree holders admitted to III semesters of Engineering programs

Lateral entrant students from B.Sc. Stream shall clear the non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First-Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award ofdegree.

AICTE Activity Points to be earned by students admitted to BE/B.Tech/B. Plan day college program (For more details refer to Chapter 6,AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, every Day College regular student admitted to the 4 years Degree program and every student entering 4 years Degree program through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the program however, minimum hours' requirement should be fulfilled. Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, the Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award the of degree only after the release of the Eighth semester GradeCard.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B. Tech in Computer Science and Business Systems

Scheme of Teaching and Examination (2018)

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2019-20)

IV SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	18MAT41	Complex Analysis, Probability, and Statistical Methods	Mathematics	2	2	--	03	40	60	100	3
2	PCC	18CB42	Design and Analysis of Algorithms	CB/CS / IS	3	2	--	03	40	60	100	4
3	PCC	18CB43	Software Engineering	CB/CS / IS	3	0	--	03	40	60	100	3
4	SH	18CB44	Fundamentals of Economics	CB/CS / IS	3	0	--	03	40	60	100	3
5	PCC	18CB45	Object Oriented Programming Concepts	CB/CS / IS	3	0	--	03	40	60	100	3
6	PCC	18CS46	Data Communication	CB/CS / IS	3	0	--	03	40	60	100	3
7	PCC	18CBL47	Design and Analysis of Algorithm Laboratory	CB/CS / IS	--	2	2	03	40	60	100	2
8	SH	18CBL48	OOPS Laboratory	CB/CS / IS	--	2	2	03	40	60	100	2
9	HSMC	18KAK49	Samskrutika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	1
		18KBK49	Balake Kannada (Kannada for Administration)									
		OR	**OR**									
		18CPH49	Constitution of India, Professional Ethics and Cyber Law		1	--	--	02	40	60		
					The examination is by objective type questions							
				TOTAL	**17**	**10**	**04**	**24**	**420**	**480**	**900**	**24**
					OR	**OR**		**OR**	**OR**	**OR**		
					18	**08**		**26**	**360**	**540**		

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course

18KA K49 Samskrutika Kannada (Kannada for communication) is for non-Kannada speaking, reading, and writing students and **18KVK49 Balake** Kannada (Kannada for Administration) is for students who speak, read and write Kannada.

The course prescribed to lateral entry Diploma holders admitted to III semesters of Engineering programs

10	NCMC	18MATDIP41	Additional Mathematics - II	Mathematics	02	01	--	03	40	60	100	0

(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semesters of BE/B.Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum of 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear forSEE.

(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award ofthedegree

Courses prescribed to lateral entry B. Sc. degree holders admitted to III semesters of Engineering programs

Lateral entrant students from B.Sc. Stream shall clear the non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First-Year Engineering Program. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award ofdegree.

AICTE activity Points: In case students fail to earn the prescribed activity Points, the Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2019–20

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2019– 20)

V SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	HSMC	18CS51	Management and Entrepreneurship for IT Industry (including fundamentals of management)	HSMC	2	2	--	03	40	60	100	3
2	PCC	18CB52	Operations Research	CB	3	2	--	03	40	60	100	4
3	PCC	18CB53	Business Communication and Value Science – II	CB	3	2	--	03	40	60	100	4
4	PCC	18CB54	Embedded Systems and IOT	CB	3	--	--	03	40	60	100	3
5	PCC	18CB55	Database Management Systems	CB	3	--	--	03	40	60	100	3
6	PCC	18CB56	Business Strategy	CB	3	--	--	03	40	60	100	3
7	PCC	18CBL57	Electronics and IOT Laboratory	CB	--	2	2	03	40	60	100	2
8	PCC	18CBL58	Database Laboratory	CB	--	2	2	03	40	60	100	2
9	HSMC	18CIV59	Environmental Studies	Civil/ Environmental [Paper setting: Civil Engineering Board]	1	--	--	02	40	60	100	1
				TOTAL	**18**	**10**	**4**	**26**	**360**	**540**	**900**	**25**

Note: PCC: Professional Core, HSMC: Humanity and Social Science.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2019 – 20
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2019 – 20)

VI SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18CB61	Computer Networks	CB	3	2	--	03	40	60	100	4
2	PCC	18CB62	Artificial Intelligence and Machine Learning withPython	CB	3	2	--	03	40	60	100	4
3	PCC	18CB63	Finance and Cost Accounting	CB	3	2	--	03	40	60	100	4
4	PEC	18CB64X	Professional Elective -1	CB	3	--	--	03	40	60	100	3
5	OEC	18CB65X	Open Elective –A	CB	3	--	--	03	40	60	100	3
6	PCC	18CBL66	Computer Networks Laboratory	CB	--	2	2	03	40	60	100	2
7	PCC	18CBL67	Artificial Intelligence and Machine Learning withPython Laboratory	CB	--	2	2	03	40	60	100	2
8	MP	18CB68	Mini Project	CB	--	--	2	03	40	60	100	2
9	INT	--	Internship	(To be carried out during the intervening vacations of VI and VII semesters)				--	--	--	--	--
				TOTAL	**15**	**10**	**6**	**24**	**320**	**480**	**800**	**24**

Note: PCC: Professional core, PEC: Professional Elective, OE: Open Elective, MP: Mini-project, INT: Internship.

Professional Elective -1

Course Code under18CB64X	Course Title
18CB641	Human Resource Management
18CB642	Introduction to Innovation IP Management and Entrepreneurship
18CB643	Advanced Java and J2EE
18CB644	Expert System and Decision Support System
18CB645	Soft and Evolutionary Computing

Open Elective –A (18CB65x are not to be opted by CSE / ISE /AIML/CSBS Program)

18CB651	Introduction to Business Communication and Value Science
18CB652	Introduction to Statistical Software (MATLAB and SPSS)
18CB653	Introduction to Web Technology

Students can select any one of the open electives offered by any Department(Please refer to the list of open electives under 18CB65X).Selection of

an open elective is not allowed provided,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Adviser/Mentor.

Mini-project work: Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can beassigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the Mini-project work, shall be based on the evaluation of project report, project presentationskill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all the guides of the college. The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25.The marksawarded for the project report shall be the same for all the batch mates.

SEE for Mini-project:

(i) Single discipline: Contribution to the Mini-project and the performance of each group member shall be assessed individually in the semester end examination (SEE)conducted at the department.

(ii) Interdisciplinary: Contribution to the Mini-project and the performance of each group member shall be assessed individually in semester end examination (SEE)conducted separately at the departments to which the student/s belong to.

Internship: All the students admitted to III year of BE/B. Tech shall have to undergo mandatory internship of 4 weeks during the vacation of VI and VII semesters and /orVII and VIII semesters. A University examination shall be conducted during VIII semester and the prescribed credit shall be included in VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not takeup/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2019 – 20

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2019 – 20)

VII SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18CB71	Business Intelligence and Data Analytics	CB	4	--	--	03	40	60	100	4
2	PCC	18CB72	Cloud Computing	CB	4	--	--	03	40	60	100	4
3	PEC	18CB73X	Professional Elective – 2	CB	3	--	--	03	40	60	100	3
4	PEC	18CB74X	Professional Elective – 3	CB	3	--	--	03	40	60	100	3
5	OEC	18CB75X	Open Elective –B	CB	3	--	--	03	40	60	100	3
6	PCC	18CBL76	Cloud Computing Laboratory	CB	--	2	2	03	40	60	100	2
7	Project	18CBP77	Project Work Phase-1	CB	--	--	2	--	100	--	100	1
8	INT	--	Internship	(If not completed during the vacation of VI and VII semesters, it has to be carried out during the intervening vacations of VII and VIII semesters								
				TOTAL	**17**	--	**4**	**18**	**340**	**360**	**700**	**20**

Note: PCC: Professional core, PEC: Professional Elective, OEC: Open Elective, INT: Internship.

Professional Elective - 2

Course Code under 18CB73X	Course Title		
18CB731	MarketingManagement and Marketing Research	18CB734	Dot Net Framework for Application Development
18CB732	Internet of Things	18CB735	Enterprise Systems
18CB733	Web and Mobile Application Development		

Professional Electives – 3

Course Code under 18CB74X	Course Title		
18CB741	Usability Design of Software	18CB744	Behavioral Economics
18CB742	Cryptography and Network Security	18CB745	Web and Cyber Security
18CB743	Data Mining and Data Warehousing		

Open Elective –B (18CB75x are not to be opted by CSE / ISE / AIML/CSBS Programs)	
18CB751	User Interface Design
18CB752	Introduction to Cloud Computing
18CB753	Python Programming

Students can select any one of the open electives offered by any Department(Please refer to the list of open electives under 18CB75X).Selection of an open elective is not allowed provided,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.
- Registration to electives shall be documented under the guidance of Programme Coordinator/ Adviser/Mentor.

Project work: Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary project can be assigned to an individual student or to a group having not more than 4 students. In extraordinary cases, like the funded projects requiring students from different disciplines, the projectstudent strength can be 5 or 6.

CIE procedure for Project Work Phase - 1:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of the project work phase -1 Report(covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the Project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of externalguide/s, if any, is desirable. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report, project presentationskill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

Internship: All the students admitted to III year of BE/B. Tech shall have to undergo mandatory internship of 4 weeks during the vacation of VI and VII semesters and /orVII and VIII semesters. A University examination shall be conducted during VIII semester and the prescribed credit shall be included in VIII semester. Internship shall beconsidered as a head of passing and shall be considered for the award of degree. Those, who do not takeup/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activityPoints. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2019 – 20

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2019 – 20)

VIII SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18CB81	Big Data Analytics	CB	3	--	--	03	40	60	100	3
2	PEC	18CB82X	Professional Elective – 4	CB	3	--	--	03	40	60	100	3
3	Project	18CBP83	Project Work Phase-2	CB	--	--	2	03	40	60	100	8
4	Seminar	18CBS84	Technical Seminar	CB	--	--	2	03	100	--	100	1
5	INT	18CBI85	Internship	(Completed during the intervening vacations of VI and VII semesters and /or VII and VIII semesters.)				03	40	60	100	3
			TOTAL		**06**	--	**4**	**15**	**260**	**240**	**500**	**18**

Note: PCC: Professional Core, PEC: Professional Elective, OEC: Open Elective, INT: Internship.

Professional Electives – 4

Course code under 18CB82X	Course Title
18CB821	Financial Management
18CB822	Software Design and Design Thinking
18CB823	Operations Management
18CB824	Computational Finance and Modelling
18CB825	High Performance Computing

Project Work CIE procedure for Project Work Phase - 2:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

SEE for Project Work Phase - 2:

(i) Single discipline: Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department.

(ii) Interdisciplinary: Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belong to.

Internship: Those, who have not pursued /completed the internship shall be declared as fail and have to complete during subsequent University examination after satisfying the internship requirements

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card. Activity points of the students who have earned the prescribed AICTE activity Points shall be sent the University along with the CIE marks of 8th semester. In case of students who have not satisfied the AICTE activity Points at the end of eighth semester, the column under activity Points shall be marked NSAP (Not Satisfied Activity Points).

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – 3rd

Transform Calculus, Fourier Series and Numerical Techniques (18MAT31)

Course Code	**18MAT31**	CIE Marks	40
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- To have an insight into Fourier series, Fourier transforms, Laplace transforms, Difference equations and Z-transforms.
- To develop the proficiency in variational calculus and solving ODE's arising in engineering applications, using numerical methods.

Module-1	**Contact Hours**
Laplace Transform: Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions (statement only) and unit-step function – problems. **Inverse Laplace Transform**: Definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) and problems. Solution of linear differential equations using Laplace transforms.	**08**
Module-2	
Fourier Series: Periodic functions, Dirichlet"s condition. Fourier series of periodic functions period and arbitrary period. Half range Fourier series. Practical harmonic analysis.	**08**
Module-3	
Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems. **Difference Equations and Z-Transforms:** Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations.	**08**
Module-4	
Numerical Solutions of Ordinary Differential Equations(ODE's): Numerical solution of ODE"s of first order and first degree- Taylor"s series method, Modified Euler"s method. Runge -Kutta method of fourth order, Milne"s and Adam-Bash forth predictor and corrector method (No derivations of formulae)-Problems.	**08**
Module-5	
Numerical Solution of Second Order ODE's: Runge-Kutta method and Milne"s predictor and corrector method. (No derivations of formulae). **Calculus of Variations:** Variation of function and functional, variational problems, Euler"s equation, Geodesics, hanging chain, problems.	**08**

Course Outcomes: At the end of the course the student will be able to:

- Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
- Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
- Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
- Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
- Determine the externals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl. No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2016
2	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	44th Edition, 2017
3	Engineering Mathematics	Srimanta Pal et al	Oxford University Press	3rd Edition, 2016

Reference Books

1	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett	McGraw-Hill Book Co	6th Edition, 1995
2	Introductory Methods of Numerical Analysis	S.S.Sastry	Prentice Hall of India	4th Edition 2010
3	Higher Engineering Mathematics	B.V. Ramana	McGraw-Hill	11th Edition,2010
4	A Textbook of Engineering Mathematics	N.P.Bali and Manish Goyal	Laxmi Publications	6th Edition, 2014
5	Advanced Engineering Mathematics	Chandrika Prasad and Reena Garg	Khanna Publishing,	2018

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER –3rd

Date Structures and Applications (18CS32)

Course Code	**18CS32**	CIE Marks	40
Teaching Hours/Week (L:P:S)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives:

- Explain fundamentals of data structures and their applications essential for programming/problem solving.
- Illustrate linear representation of data structures: Stack, Queues, Lists, Trees and Graphs.
- Demonstrate sorting and searching algorithms.
- Find suitable data structure during application development/Problem Solving.

Module-1 **10 Hours**

Introduction: Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays.

Array Operations: Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices.

Strings: Basic Terminology, Storing, Operations and Pattern Matching algorithms, Programming Examples.

Module-2 **10 Hours**

Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression.

Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function.

Queues: Definition, Array Representation, Queue Operations, Circular Queues, Circular, queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues. Programming Examples.

Module-3 **10 Hours**

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples.

Module-4 **10 Hours**

Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked, Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples.

Module-5 **10 Hours**

Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search.

Sorting and Searching: Insertion Sort, Radix sort, Address Calculation Sort.

Hashing: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.

Files and Their Organization: Data Hierarchy, File Attributes, Text Files and Binary Files, Basic File Operations, File Organizations and Indexing

Course outcomes: At the end of the course the student will be able to:

- Use different types of data structures, operations and algorithms.
- Apply searching and sorting operations on files.
- Use stack, Queue, Lists, Trees and Graphs in problem solving.
- Implement all data structures in a high-level language for problem solving.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20marks.
- There will be two full questions from each module.
- Eachfullquestionwillhavesubquestioncoveringallthetopicsunderamodule.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Fundamentals of Data Structures in C	Ellis Horowitz and Sartaj Sahni	Universities Press	2nd Edition, 2014
2	Data Structures Schaum's Outlines	Seymour Lipschutz	McGraw Hill	Revised 1st Ed, 2014

Reference Books

1	Data Structures: A Pseudo-code approach with	Gilberg & Forouzan	CengageLearning	2nd Edition, 2014
2	Data Structures using C	Reema Thareja	Oxford press	3rd Edition, 2012
3	An Introduction to Data Structures with Applications	Jean-Paul Tremblay & Paul G. Sorenson	McGraw Hill	2nd Edition, 2013
4	Data Structures using C	A M Tenenbaum	PHI	1989
5	Data Structures and Program Design in C	Robert Kruse	PHI	2nd Ed, 1996

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – 3rd

Business Communication and Value Science - I (18CB33)

Course Code	**18CB33**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: Graduates shall be able to

1. Understand what life skills are and their importance in leading a happy and well-adjusted life
2. Motivate students to look within and create a better version of self
3. Introduce them to key concepts of values, life skills and business communication

Module-1	**Contact Hours**
Overview of LOL (include activity on introducing self) **Class activity** – presentation on favorite cricket captain in IPL and the skills and values they demonstrate **Self-work with immersion** – interview a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them **Overview of business communication** **Activity**: Write a newspaper report on an IPL match	**8hrs**
Module-2	
Activity: Record a conversation between a celebrity and an interviewer **Quiz Time** **Self-awareness** – identity, body awareness, stress management **Essential Grammar – I:** Refresher on Parts of Speech – Listen to an audio clip and note down the different parts of speech followed by discussion Tenses: Applications of tenses in Functional Grammar – Take a quiz and then discuss **Sentence formation** (general & Technical), Common errors, Voices. Show sequence from film where a character uses wrong sentence structure (e.g. Zindagi Na Milegi Dobara where the characters use 'the' before every word)	**8hrs**
Module-3	
Communication Skills: Overview of Communication Skills Barriers of communication, Effective communication **Types of communication**- verbal and non – verbal – Role-play based learning **Importance of Questioning** **Expressing self**, connecting with emotions, visualizing and experiencing purpose **Activity:** Skit based on communication skills **Evaluation on Listening skills –** listen to recording and answer questions based on them **Email writing**: Formal and informal emails, activity	**8hrs**
Module-4	
Verbal communication: Pronunciation, clarity of speech **Vocabulary Enrichment:** Exposure to words from General Service List (GSL) by Wes Academic word list (AWL) technical specific terms related to the field of technology, phrase idioms, significant abbreviations formal business vocabulary – Read Economic Times, Reader' Digest, National Geographic and take part in a GD, using the words you learnt/liked from the articles. Group discussion using words learnt **Practice:** Toastmaster style Table Topics speech with evaluation **Written Communication**: Summary writing, story writing **Build your CV** – start writing your comprehensive CV including every achievement in your life, no format, no page limit	**8hrs**

Project: Create a podcast on a topic that will interest college students **Life skill:** Stress management, working with rhythm and balance, colours, and teamwork **Project:** Create a musical using the learnings from unit	
Module-5	
Understanding Life Skills: Movie based learning – **Pursuit of Happiness.** What are the skills and values you can identify, what can you relate to? **Introduction to life skills** What are the critical life skills **Multiple Intelligences** **Embracing diversity** – Activity on appreciation of diversity **Life skill:** Community service – work with an NGO and make a presentation **Life skill: Join a trek –** Values to be learned: Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity, result orientation	**8hrs**

Course Outcomes: At the end of the course the student will be able to:

- Recognize the need for life skills and values
- Recognize own strengths and opportunities
- Apply the life skills to different situations
- Understand the basic tenets of communication
- Apply the basic communication practices in different types of communication

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl. No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	There are no prescribed texts for Semester 1 – there will be handouts and reference links shared.			

Reference Books

1	English vocabulary in use	Alan Mc'carthy and O'dell		
2	APAART: Speak Well 1 (English language and communication)			
3	APAART: Speak Well 2 (Soft Skills)			
4	Business Communication	Dr. Saroj Hiremath		

Web References

1	Train your mind to perform under pressure- Simon sinek https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/
2	Brilliant way one CEO rallied his team in the middle of layoffs https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html
3	Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0

Online Resources

1	https://www.coursera.org/learn/learning-how-to-learn
2	https://www.coursera.org/specializations/effective-business-communication

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – 3rd

Computer Organization (18CB34)

Course Code	**18CB34**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- Explain the basic sub systems of a computer, their organization, structure and operation.
- Illustrate the concept of programs as sequences of machine instructions.
- Demonstrate different ways of communicating with I/O devices and standard I/O interfaces.
- Describe memory hierarchy and concept of virtual memory.
- Describe arithmetic and logical operations with integer and floating-point operands.
- Illustrate organization of a simple processor, pipelined processor and other computing systems.
- Demonstrate the use of flipflops and apply for registers

Module-1	Contact Hours
Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions	**08**
Module-2	
Input/ Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, DirectMemory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.	**08**
Module-3	
Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations.	**08**
Module-4	
Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.	**08**
Module-5	
Karnaugh maps: minimum forms of switching functions, two and three variable Karnaugh maps, four variable karnaugh maps, determination of minimum expressions using essential prime implicants Edge-Triggered D Flip Flop 3,SR Flip Flop, J K Flip Flop, T Flip Flop, Flip Flop with additional inputs, AsynchronousSequential Circuits	**08**

Course outcomes: At the end of the course the student will be able to:

- Explain the basic organization of a computer system.
- Demonstrate functioning of different sub systems, such as processor, Input/output,and memory.
- Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
- Design and analyse simple arithmetic and logical units.
- Simplify digital circuits using Karnaugh Map and explain flip flops and make us in designing different data processing circuits.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Computer Organization	Carl Hamacher, Zvonko Vranesic, Safwat Zaky	Tata McGraw Hill	5th Edition 2002 (Listed topics only from Chapters 1, 2, 4, 5, 6, 7, 8, 9 and12)
2	Analog and Digital Electronics	Charles H Roth and Larry L Kinney	Cengage Learning	2019
Reference Books				
1	Computer Organization & Architecture	William Stallings	Pearson	9th Edition, 2015

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – 3rd

Operating Systems (18CB35)

Course Code	**18CB35**	CIE Marks	40
Teaching Hours/Week (L:P:S)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will enable students to:

- Student should identify the concepts, principles and services of operating system
- All fundamentals of operating system, abstractions and demonstrate them
- Explain protection and security requirements of operating systems analyze basic resource management techniques in job and process scheduling
- Compare different memory management techniques and apply concurrency and synchronization techniques to write concurrent programs.

Module-1	**Contact Hours**
Introduction to operating systems & their classification: What is an operating system, Mainframe systems, Desktop systems, Multiprocessor system, Distributed system, Clustered system, Real time system, Handheld system, Feature migration, Computing environments, Operating system structures: System components, OS Services, System calls, System programs, System structure, Virtual machines.	**08**
Module-2	
Process, Inter process Communication, Threads & CPU Scheduling: Process concept, Process scheduling, Operation on processes, cooperating processes, Inter process communication. Threads - Overview, Multithreading models, Threading issues, Pthreads, Java threads. CPU scheduling – Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Real time scheduling.	**08**
Module-3	
Process Synchronization and handling Deadlocks: The Critical section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors. Deadlock - System model, Deadlock characterization, Methods for handling deadlocks - Deadlock prevention, deadlock avoidance, Deadlock detection and recovery from deadlock.	**08**
Module-4	
. Storage Management: Main memory management - Background, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging. Virtual memory - Background, Demand paging, Process creation, Page replacement algorithms, Allocation of frames, Thrashing. File System interface - File concept, Access methods, Directory structure, Disk scheduling methods, Disk management, Swap space management.	**08**
Module-5	
Protection and Security : Goals of protection , Domain of protection, Access matrix ,implementation of access matrix, Revocation of access rights, The security problem, Authentication, Program threats, System threats, Securing systems and facilities, Intrusion detection	**08**

Course outcomes: At the end of the course the student will be able to:

- Describe the importance of computer system resources and the role of operating system in their management
- Illustrate the process management communication, threads and scheduling of processes by CPU
- Evaluate the requirement for process synchronization and coordination handled by operating system
- Implement memory allocation policies and Comprehend the use of different storage management technologies
- Identify the different aspects of protection, security, authentication and threats.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	An Introduction to Operating Systems	P.C.P Bhatt	PHI	2nd Edition
2	Modern Operating Systems	Andrew S Tanenbaum	PHI	3rd Edition
	Reference Books			
1	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	John wiley& Sons	9th Edition 2012
2	Operating system concepts and design	Milan Milankovic	McGraw Hill	2nd Edition 2008

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS
(CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education
(OBE) SEMESTER – 3rd

Discrete Mathematical Structure (18CB36)

Course Code	**18CB36**	CIE Marks	40
Teaching Hours/Week (L:P:S)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1	**Contact Hours**
Sets, Operations on sets, Cardinality of sets, inclusion-exclusion principle, pigeonhole principle matrices, finding Eigen values and Eigen vectors, Relations and Their Properties, n-array Relations and Their Application, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings	**08**
Module-2	
Propositional Logic, Applications of Propositional Logic, Propositional Equivalences Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Graphs and Graphs models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring	**08**
Module-3	
Introduction to Finite Automata: The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata. An application of finite automata, Finite automata with Epsilon transitions	**08**
Module-4	
Regular Expressions: Finite Automata and Regular Expressions Applications of Regular Expressions. Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata	**08**
Module-5	
Context–free grammars: Parse trees; Applications; Ambiguity in grammars and Languages. Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's.	**08**

Course outcomes: At the end of the course the student will be able to:

1. Understand regular languages and finite automata.
2. Understand context-free languages, push-down automata, and Turing recognizable languages.
3. Be exposed to a broad overview of the theoretical foundations of computer science.
4. Be familiar with thinking analytically and intuitively for problem-solving situations in related areas of theory in computer science.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Discrete Mathematics and its Applications	Kenneth H Rosen	McGraw Hill publications	7th edition.

2	Automata Theory, Language, and Computation	John E Hopcroft, Rajeev Motwani and Jaffery D Ullman	Pearson and Addison Wesley	3rd Edition
3	Introduction to Theory of Computation	Michael Sipser	International Thompson Publishing	1996
Reference Books				
1	Discrete Mathematics	J.K Sharma	Mac Millian Publishers India	3rd edition, 2011
2	Introduction to Computer Theory	Daniel I.A. Cohen	John Wiley and Sons	2009
3	Introduction to languages and the Theory of computation	John C Martin	TMH 3	2007

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – 3rd

Operating Systems Laboratory (18CBL37)

Course Code	**18CBL37**	CIE Marks	40
Teaching Hours/Week(L:T:P)	0:2:2	SEE Marks	60
Credits	2	Exam Hours	03

Course Learning Objectives: Students are able to

- Implement practical experience with designing and implementing concepts of Inter process Communication
- Write the code to implement and modify various concepts in Operating Systems using Linux environment.
- Implement Various CPU Scheduling algorithms
- Implement Various Memory Management Schemes.

Sl. No.	Experiment
1.	Simulate the following CPU scheduling algorithms. a) FCFS b) SJF c) Round Robin d) Priority.
2.	Write a C program to simulate producer-consumer problem using Semaphores
3.	Write a C program to simulate the concept of Dining-philosophers problem.
4.	Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit.
5.	Simulate all page replacement algorithms a)FIFO b) LRU c) OPTIMAL
6.	Simulate all File Organization Techniques a) Single level directory b) Two level directory
7.	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.
8.	Simulate Bankers Algorithm for Dead Lock Avoidance.
9.	Simulate Bankers Algorithm for Dead Lock Prevention.
10.	Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN REFERENCE

Course Outcomes:

The student should be able to:

- Ability to implement inter process communication between two processes
- Ability to design and solve synchronization problems.
- Ability to simulate and implement operating system concepts such as scheduling,
- Deadlock management, file management, and memory management.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakupofmarksandtheinstructionsprintedonthecoverpageofanswerscripttobestrictlyadheredbytheexaminers.
3. Studentscanpickoneexperimentfromthequestionslotpreparedbytheexaminers.
4. Changeofexperimentisallowedonlyonceand15%Marksallottedtotheprocedureparttobemadezero.

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 3rd

Date Structures Laboratory (18CSL38)

Course Code	**18CSL38**	CIE Marks	40
Teaching Hours/Week(L:T:P)	0:2:2	SEE Marks	60
Credits	2	Exam Hours	03

Course Learning Objectives:
This laboratory course enables students to get practical experience in design, develop, implement, analyze and evaluation/testing of

- Asymptotic performance of algorithms.
- Linear data structures and their applications such as stacks, queues and lists
- Non-Linear data structures and their applications such as trees and graphs
- Sorting and searching algorithms

Sl. No.	Experiment
1.	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position (POS) e. Exit. Support the program with functions for each of the above operations.
2.	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3.	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations.
4.	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
5.	Design, Develop and Implement a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %,^ b. Solving Tower of Hanoi problem with n disks
6.	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations.
7.	Design, Develop and Implement a menu driven Program in C for the following operations on Singly

	Linked List (SLL) of Student Data with the fields: USN, Name, Programme, Sem,PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit
8.	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation,Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
9.	Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial $P(x,y,z) = 6x^2y^2z - 4yz^5+3x^3yz+2xy^5z-2xyz^3$ b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations
10.	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
11.	Design, Develop and Implement a Program in C for the following operations on Graph(G)of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method
12.	Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design and develop a Program in C that uses Hash function H: K L as H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

Course Outcomes:

The student should be able to:

- Analyze and Compare various linear and non-linear data structures
- Code, debug and demonstrate the working nature of different types of data structures and their applications
- Implement, analyze and evaluate the searching and sorting algorithms
- Choose the appropriate data structure for solving real world problems

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakupofmarksandtheinstructionsprintedonthecoverpageofanswerscripttobestrictlyadheredbytheexaminers.
3. Studentscanpickoneexperimentfromthequestionslotpreparedbytheexaminers.
4. Changeofexperimentisallowedonlyonceand15%Marksallottedtotheprocedureparttobemadezero.

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 4th

Complex Analysis, Probability Statistical Methods (18MAT41)

Course Code	**18MAT41**	CIE Marks	40
Teaching Hours/Week (L:P:S)	2:2:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will enable students to:

- To provide an insight into applications of complex variables, conformal mapping and special functions arising in potential theory, quantum mechanics, heat conduction and field theory.
- To develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, design engineering and microwave engineering.

Module-1 **8 Hrs**

Calculus of complex functions: Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in cartesian and polar forms and consequences. Construction of analytic functions: Milne-Thomson method-Problems.

Module-2 **8 Hrs**

Conformal transformations: Introduction. Discussion of transformations: $w = z^2$, $w = e^z$, $w = z + \frac{1}{z}$, $(z \neq 0)$. Bilinear transformations- Problems.

Complex integration: Line integral of a complex function-Cauchy"s theorem and Cauchy"s integral formula and problems.

Module-3 **8 Hrs**

Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples.

Module-4 **8 Hrs**

Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form- $y = ax + b$, $y = ax^b$ & $y = ax^2 + bx + c$.

Statistical Methods: Correlation and regression-Karl Pearson"s coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems.

Module-5 **8 Hrs**

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation and covariance.

Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student"s t-distribution, Chi-square distribution as a test of goodness of fit.

Course outcomes: At the end of the course the student will be able to:

- Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
- Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
- Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
- Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
- Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10^{th} Edition, 2016
2	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	44^{th} Edition, 2017
Reference Books				
1	Introductory Methods of Numerical Analysis	S.S.Sastry	Prentice Hall of India	4^{th} Edition 2010
2	Higher Engineering Mathematics	B.V.Ramana	McGraw-Hill	11^{th} Edition,2010
3	A Text Book of Engineering Mathematics	N.P.Bali and Manish Goyal	Laxmi Publications	,6^{th} Edition, 2014

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 4th

Design and Analysis of Algorithms (18CB42)

Course Code	**18CB42**	CIE Marks	40
Teaching Hours/Week (L:P:S)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Explain various computational problem solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis.

Module-1	**Contact Hours**
Introduction: What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1), Performance Analysis: Space complexity, Time complexity (T2:1.3).), and Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples (T1:2.2, 2.3, 2.4). Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. Fundamental Data Structures: Stacks, Queues, Graphs, Trees, Sets and Dictionaries. (T1:1.3,1.4). RBT: L1, L2, L3	**10**
Module-2	
Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum (T2:3.1, 3.3, 3.4), Merge sort, Quick sort (T1:4.1, 4.2), Strassen‟s matrix multiplication (T2:3.8), Advantages and Disadvantages of divide and conquer. Decrease and Conquer Approach: Topological Sort. (T1:5.3). Transform and Conquer Approach: Heaps and Heap Sort (T1:6.4). RBT: L1, L2, L3	**10**
Module-3	
Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4.3, 4.5). Minimum cost spanning trees: Prim‟s Algorithm, Kruskal‟s Algorithm (T1:9.1, 9.2). Single source shortest paths: Dijkstra's Algorithm (T1:9.3). Optimal Tree problem: Huffman Trees and Codes (T1:9.4). RBT: L1, L2, L3	**10**
Module-4	
Dynamic Programming: General method with Examples, Multistage Graphs (T2:5.1, 5.2). Transitive Closure: Warshall‟s Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem ((T1:8.2, 8.3, 8.4), Bellman-Ford Algorithm (T2:5.4), Travelling Sales Person problem (T2:5.9), Reliability design (T2:5.8). RBT: L1, L2, L3	**10**
Module-5	
Backtracking: General method (T2:7.1), N-Queens problem (T1:12.1), Sum of subsets problem (T1:12.1), Graph coloring (T2:7.4), Hamiltonian cycles (T2:7.5). Programme and Bound: Assignment Problem, Travelling Sales Person problem (T1:12.2), 0/1 Knapsack problem (T2:8.2, T1:12.2): LC Programme and Bound solution (T2:8.2), FIFO Programme and Bound solution (T2:8.2). Probabilistic and Randomized Algorithms: Probabilistic Algorithms Randomizing deterministic Algorithms: Randomizing Probelinsrch quicksort, MonteCarlo Algorithm, Biased Monte Carlo Algorithms: A Montecarlo algorithm for testing polynomial quality, Introduction to Las vegas Algorithms (T3:24.1, 24.2,24.3) NP-Complete and NP-Hard problems: Basic concepts, non deterministic algorithms, P,NP, NP-Complete, and NP-Hard classes (T2:11.1). RBT: L1, L2, L3	**10**

Course outcomes: At the end of the course the student will be able to:

- Describe the basic algorithm design strategies and use them for devising new solutions to various problems
- Analyse algorithms for time/space complexity
- Differentiate between deterministic and probabilistic algorithms and use the probabilistic algorithms in appropriate scenarios

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Introduction to the Design and Analysis of Algorithms,	Anany Levitin	Pearson.	2rd Edition, 2009.
2	Computer Algorithms/C++	Ellis Horowitz, Satraj Sahni and Rajasekaran	Universities Press	2nd Edition, 2014
3	Algorithms	Kenneth A Berman and Jerome L Paul	Cengage Learning India Pvt Ltd	2002 edition
Reference Books				
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein	PHI	3rd Edition
2	Design and Analysis of Algorithms	S. Sridhar	Oxford (Higher Education).	

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 4th

SOFTWARE ENGINEERING (18CB43)

Course Code	**18CB43**	CIE Marks	40
Teaching Hours/Week (L:P:S)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives: This course will enable students to

- Identify ethical and professional issues and explain why they are of concern to software engineers.
- Recognize the importance of software maintenance and describe the intricacies involved in software evolution.
- Apply estimation techniques, schedule project activities and compute pricing.
- Identify software quality parameters and quantify software using measurements and metrics.
  Recognize the need for agile software development, describe agile methods, apply agile practices and plan for agility.

Module-1	**Contact Hours**
Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. **Software Processes:** Models: Waterfall Model, Incremental Model and Spiral Model, Process activities. **Requirements Engineering:** Requirements Engineering Processes. Requirements Elicitation and Analysis, Functional and non-functional requirements. The software Requirements Document, Requirements Specification, Requirements validation, Requirements Management.	**08**
Module-2	
System Models: Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering. **Design and Implementation:** Introduction to RUP, Design Principles, Object-oriented design using the UML, Design patterns, Implementation issues, Open source development.	**08**
Module-3	
Software Testing: Development testing, Test-driven development, Release testing, User testing, Test Automation. **Software Evolution:** Evolution processes, Program evolution dynamics, Software maintenance, Legacy system management	**08**
Module-4	
Project management: Risk management, Managing People, Teamwork. **Project Planning:** Software pricing, Plan-driven development, Project scheduling: Estimation techniques, Quality management: Software quality, Reviews and inspections, Software measurement and metrics, Software standards	**08**
Module-5	
Agile Software Development: Coping with Change, The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref "The SCRUM Primer, Ver 2.0") and Extreme Programming. Plan-driven and agile development. Agile project management, Scaling agile methods.	**08**

Course outcomes: At the end of the course the student will be able to:

- Design a software system, component, or process to meet desired needs within realistic constraints.
- Assess professional and ethical responsibility
- Function on multi-disciplinary teams
- Use the techniques, skills, and modern engineering tools necessary for engineering practice
- Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Software Engineering	Ian Sommerville	Pearson Education	9th Edition, 2012
Reference Books				
1	Software Engineering-A Practitioners approach	Roger S. Pressman	Tata McGraw Hil	7th Edition
2	An Integrated Approach to Software Engineering	Pankaj Jalote	Wiley India	---

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS
(CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education
(OBE) SEMESTER – 4th

Fundamentals of Economics (18CB44)

Course Code	**18CB44**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- To impart knowledge, with respect to concepts, principles of Economics, which govern the functioning of a firm/organization
- To explain the students about concept of production, cost, national income, an aggregate supply and aggregate demand consumption

Module-1	**Contact Hours**
INTRODUCTION TO ECONOMICS: Economics – Deinition - Types of Economic Analysis – Micro and Macro Economics, Demand - Types, Determinants; Supply - Determinants - Demand Curve - Supply Curve - Market Equilibrium -Elasticity of Demand and Supply.	**08**
Module-2	
WELFARE ANALYSIS: Consumers' and Producers' Surplus - Price Ceilings and Price Floors Consumer Behaviour - Axioms of Choice – Law of diminishing Marginal Utility - Budge Constraints and Indifference Curves; Consumer's Equilibrium - Effects of a Price Change Income and Substitution Effects -Derivation of a Demand Curve; Applications – Tax and Subsidies - Intertemporal Consumption - Suppliers' Income Effect	**08**
Module-3	
THEORY OF PRODUCTION: Production Function – Types, Return to scale and Iso-quants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition	**08**
Module-4	
INTRODUCTION – MACROECONOMICS BASIC: National Income and its Components - GNP, NNP, GDP, NDP – Methods of measuring National Income; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector - Taxes and Subsidies; External Sector - Exports and Imports, Circular Flow of Money Income.	**08**
Module-5	
MONEY – DEFINITIONS: Demand for Money -Transactionary and Speculative Demand; Supply of Money - Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model; Business Cycles and Stabilization – Monetary Policy – Objectives, Techniques, Fiscal Policy – Objectives, Types, Instruments, Economic Growth - Central Bank and the Government; The Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment.	**08**

Course outcomes: At the end of the course the student will be able to:

- Understand basic principles and concepts of Microeconomics and use them to solve real world business problems.
- Develop an understanding of the basic macroeconomic principles; and appreciate the relationship between key macroeconomic variables such as the investment, savings, inlation, employment, money supply, trade and for ex. etc.
- Explain the fundamentals of national income and Aggregate supply and aggregate demand consumption.
- Comprehend the concepts of money and banking.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Microeconomics	Robert S.Pindyck, and Daniel L. Rubinfeld	Pearson Publishing House	9th Edition
2	Macroeconomics	Dornbusch, Fischer and Startz	McGraw-Hill	12th Edition
3	Macroeconomics: Theory and Policy	D N Dwivedi,	McGraw-Hill	5th Edition
	Reference Books			
1	Intermediate Microeconomics: A Modern Approach	Hal R, Varian,	W W Norton & Co Inc	8th Edition
2	Principles of Macroeconomics	N. Gregory Mankiw	Cengage Learning	8th Edition 2017
3	Economics	Paul Anthony Samuelson, William D. Nordhaus	McGrawHil	19th Edition 2011

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – 4th

OBJECT ORIENTED PROGRAMMING CONCEPTS (18CB45)

Course Code	**18CB45**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: Graduates shall be able to

1. Develop an understanding of the essential principles in object oriented programming
2. Implement object oriented programming concepts using Object Oriented programming Language
3. Develop and understand the Constructors and destructors.
4. Implement the operator overloading using classes.
5. Implementing the File Handling Operations.

Module-1	**Contact Hours**
Introduction to C++: A Review of Structures, Procedure-Oriented Programming Systems , Object-Oriented Programming Systems , Comparison of C++ with , Console Input/Output in C++ ,Variables in C++ , Reference Variables in C++ , Function Prototyping , Function Overloading 21 , Default Values for Formal Arguments of Functions , Inline Functions. **Classes and Objects:** Introduction to Classes and Objects, Member Functions and Member Data, Objects and Functions, Objects and Arrays, Namespaces, Nested Inner Classes.	**08**
Module-2	
Dynamic Memory Management: Introduction, Dynamic Memory Allocation, Dynamic Memory Deallocation. **Constructors and Destructors:** Constructors, Destructors. **Inheritance:** Introduction, Base Class and Derived Class Pointers, Function Overriding, Different Kinds of Inheritance.	**08**
Module-3	
Virtual Functions and Dynamic Polymorphism: Need for Virtual Functions , Virtual Functions ,Mechanism of Virtual Functions, Pure Virtual Functions, Virtual Destructors and Virtual Constructors **Exception Handling**: Introduction, C-Style Handling of Error-generating Code, C++-Style Solution—the try/throw/catch Construct, Limitation of Exception Handling.	**08**
Module-4	
Operator Overloading, Type Conversion: Operator Overloading, Overloading Various Operators, Type Conversion, **and Templates**: Introduction, Function Templates, Class Templates.	**08**
Module-5	
Stream and File Handling: Streams, Hierarchy for Handling Streams, Text and Binary Input/Output, Text Versus Binary Files, Text Output/Input, Binary Output/Input, Opening and Closing Files, File Pointers, Error Handling.	**08**

Course Outcomes: At the end of the course the student will be able to:

- Explain the object-oriented concepts.
- Develop computer programs to solve real world problems in Java.
- Develop simple GUI interfaces for a computer program to interact with users, and to understandthe event-based GUI handling principles using swings.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks				
Sl. No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Edition and year**
1	Object Oriented Programming with C++	Sourav Sahay	Oxford University Press	2nd Edition 2006
2	Java The Complete Reference	Herbert Schildt	Tata McGraw Hill	7th Edition, 2007
Reference Books				
1	Mahesh Bhave and Sunil Patekar	Programming with Java	PearsonEducation	First Edition, 2008
2	Herbert Schildt	The Complete Reference C++	Tata McGraw Hill	4th Edition, 2003
3	Stanley B.Lippmann, Josee Lajore	C++ Primer	Pearson Education	4th Edition, 2005

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 4th

Data Communication (18CS46)

Course Code	**18CS46**	CIE Marks	40
Teaching Hours/Week (L:P:S)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students to:

- Comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Explain with the basics of data communication and various types of computer networks
- Demonstrate Medium Access Control protocols for reliable and noisy channels.
- Expose wireless and wired LANs

Module-1 **8Hrs**

Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration, **Networks Models:** Protocol Layering, TCP/IP Protocol suite, The OSI model, **Introduction to Physical Layer-1:** Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance.

Module-2 **8Hrs**

Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding).**Physical Layer-2:** Analog to digital conversion (only PCM), Transmission Modes, **Analog Transmission:** Digital to analog conversion.

Module-3 **8Hrs**

Bandwidth Utilization: Multiplexing and Spread Spectrum, **Switching:** Introduction, Circuit Switched Networks and Packet switching. **Error Detection and Correction:** Introduction, Block coding, Cyclic codes, Checksum,

Module-4 **8Hrs**

Data link control: DLC services, Data link layer protocols, Point to Point protocol (Framing, Transition phases only).**Media Access control:** Random Access, Controlled Access and Channelization, **Introduction to Data-Link Layer:** Introduction, Link-Layer Addressing, ARP. **IPv4 Addressing and subnetting:** Classful and CIDR addressing, DHCP, NAT

Module-5 **8Hrs**

Wired LANs Ethernet: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, **Wireless LANs:** Introduction, IEEE 802.11 Project and Bluetooth. **Other wireless Networks:** Cellular Telephony.

Course outcomes: At the end of the course the student will be able to:

- Explain the various components of data communication.
- Explain the fundamentals of digital communication and switching.
- Compare and contrast data link layer protocols.
- Summarize IEEE 802.xx standards

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each

	module.			
Textbook/ Textbooks				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Edition and year**
1	Data Communications and Networking 5E,	Behrouz A. Forouzan	Tata McGraw-Hill	5th Edition, 2013.
Reference Books				
1	Communication Networks - Fundamental Concepts and Key architectures,	Alberto Leon-Garcia and Indra Widjaja	McGraw-Hill	2nd Edition, 2004.
2	Data and Computer Communication,	William Stallings	Pearson Education,	8th Edition 2007.
3	Computer Networks – A Systems Approach,	Larry L. Peterson and Bruce S. Davie	Elsevier,	4th Edition, 2007.
4	Computer and Communication Networks	Nader F. Mir	Pearson Education,	2007.

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS
(CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education
(OBE) SEMESTER – 4th

DESIGN AND ANALYSIS OF ALGORITHM LABORATORY (18CBL47)

Course Code	**18CBL47**	CIE Marks	40
Teaching Hours/Week (L:T:P)	0:2:2	SEE Marks	60
Credits	2	Exam Hours	03

Course Learning Objectives:

This course will enable students to:

- Design and implement various algorithms in C/C++ program.
- Employ various design strategies for problem solving.
- Measure and compare the performance of different algorithms.
- Design, develop, and implement the specified algorithms for the following problems.
- Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.

Sl. No.	Experiment
1	
a	Create a class called Student with the following details as variables within it. (i) USN (ii) Name (iii) Program (iv) Phone Write a program to create n Student objects and print the USN, Name, Programme, and Phon these objects with suitable headings.
b	Write a program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working
2	
a	Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Inheret this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a C++ program to read and display at least 3 staff objects of all three categories.
b	Write a class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write a functions to read customer data and display.
3	Write a program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.
4	Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C+ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5	Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C+ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
6	Implement the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
7	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra‟s algorithm. Write the program C/C++
8	Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal‟s algorithm. Use Union-Find algorithms in your program
9	Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
10	Write a programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm. (b) Implement Travelling Sales Person problem using Dynamic programming
11	Design and implement in to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle

Course Outcomes:

- Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
- Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
- Analyze and compare the performance of algorithms using language features.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Breakupofmarksandtheinstructionsprintedonthecoverpageofanswerscripttobestrictlyadheredbytheexaminers.
3. Studentscanpickoneexperimentfromthequestionslotpreparedbytheexaminers.
4. Changeofexperimentisallowedonlyonceand15%Marksallottedtotheprocedureparttobemadezero.

OOPS Laboratory (18CBL48)

CourseCode	**18CBL48**	CIEMarks	40
TeachingHours/Week(L:T:P)	0:2:2	SEEMarks	60
Credits	2	ExamHours	03

Course Learning Objectives:

This laboratory course enables students to get practical experience in design, develop, implement, analyze and evaluation/testing of

- Asymptotic performance of algorithms.
- Linear data structures and their applications such as stacks, queues and lists
- Non-Linear data structures and their applications such as trees and graphs
- Sorting and searching algorithms

Sl. No.	Experiment
1.	Write a program to find the sum for the given variables using function with default arguments.
2.	Write a program to swap the values of two variables and demonstrates a function using call by value.
3.	Write a program to create a template function for Bubble Sort and demonstrate sorting of integers and doubles.
4.	Define a STUDENT class with USN, Name, and Marks in 3 tests of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the USN, Name and the average marks of all the students.
5.	Write a C++ program to create a class called COMPLEX and implement the following overloading functions ADD that return a complex number: (i) ADD (a, s2) – where „a" is an integer (real part) and s2 is a complex number (ii) ADD (s1, s2) – where s1 and s2 are complex numbers.
6.	Friend functions and friend classes: a) Write a program to define class name HUSBAND and WIFE that holds the income respectively. Calculate and display the total income of a family using Friend function. b) Write a program to accept the student detail such as name and 3 different marks by get_data() method and display the name and average of marks using display() method. Define a friend class for calculating the average of marks using the method mark_avg()
7.	Create a class called MATRIX using two-dimensional array of integers. Implement the following operations by overloading the operator == which checks the compatibility of two matrices to be added and subtracted. Perform the addition and subtraction by overloading the + and – operators respectively. Display the results by overloading the operator <<. If (m1== m2) then m3 = m1+m2 and m4 = m1- m2 else display error.
8.	Define a class SET with Data members: array of int, int variable to indicate number of elements in a SET object; and Member functions: to read element of a SET object, to print elements of a SET object, to find union of 2 objects of SET using operator overloading (S3=S1+S2), to find intersection of 2 objects of SET using operator overloading (S4= S1*S2). S1, S2, S3 and S4 are objects of SET. Use this class in a main function to show the above operations.
9.	Create an abstract base class EMPLOYEE with data members: Name, EmpID and BasicSal and a pure virtual function Cal_Sal().Create two derived classes MANAGER (with data members: DA and HRA and SALESMAN (with data members: DA, HRA and TA). Write appropriate constructors and member functions to initialize the data, read and write the data and to calculate the net salary. The main() function should create array of base class pointers/references to invoke overridden functions and hence to implement run-time polymorphism.
10.	Write a program to concatenate 2 strings using STL String class functions.

Course Outcomes:

The student should be able to:

- Students will gain understanding about the object oriented principles in construction of robust and maintainable programs.
- A competence to design , write, compile, test and execute programs using high level language.
- An awareness of the need for a professional approach to design and the importance of good documentation to finish.

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY(INCLUDING FUNDAMENTALS OF MANAGEMENT)

Course Code	**18CS51**	CIE Marks	40
Teaching Hours / Week (L:T:P)	2:2:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Explain the principles of management, organization and entrepreneur.
- Discuss on planning, staffing, ERP and their importance
- Infer the importance of intellectual property rights and relate the institutional support

Module - 1

Introduction - Meaning, nature and characteristics of management, scope and Functional areas of management, goals of management, levels of management, brief overview of evolution of management theories,. Planning- Nature importance, types of plans, steps in planning, Organizing- nature and purpose, types of Organization, Staffing- meaning, process of recruitment and selection

8Hours

Module - 2

Directing and controlling- meaning and nature of directing, leadership styles, motivation Theories, Communication- Meaning and importance, Coordination- meaning and importance, Controlling- meaning, steps in controlling methods of establishing control.

8Hours

Module - 3

Entrepreneur – meaning of entrepreneur, characteristics of entrepreneurs, classification and types of entrepreneurs various stages in entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India and barriers to entrepreneurship. Identification of business opportunities, market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.

8Hours

Module - 4

Preparation of project and ERP - meaning of project, project identification, project selection, project report, need and significance of project report, contents, formulation, guidelines by planning commission for project report, Enterprise Resource Planning: Meaning and Importance- ERP and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation

8Hours

Module - 5

Micro and Small Enterprises: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India indusial policy 2007 on micro and small enterprises, case study (Microsoft), Case study(Captain G R Gopinath),case study (N R Narayana Murthy & Infosys), Institutional support: MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, Introduction to IPR.

8Hours

Course Outcomes: At the end of the course, students will be able to:

- Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship
- Utilize the resources available effectively through ERP
- Make use of IPRs and institutional support in entrepreneurship

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Principles of Management	P. C. Tripathi, P. N. Reddy	Tata McGraw Hill	4th / 6th Edition
2	Dynamics of Entrepreneurial Development & Management	Vasant Desai	Himalaya Publishing House	-
3	Entrepreneurship Development -Small Business Enterprises	Poornima M Charantimath	Pearson Education	2006
4	Management and Entrepreneurship	Kanishka Bedi	Oxford University Press	2017

Reference Books

1. Management Fundamentals -Concepts, Application, Skill Development Robert Lusier – Thomson.
2. Entrepreneurship Development -S S Khanka -S Chand & Co.
3. Management -Stephen Robbins -Pearson Education /PHI -17th Edition, 2003

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

OPERATIONS RESEARCH

Course Code	**18CB52**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Objectives: This course will enable students

- Formulate optimization problem as a linear programming problem.
- Solve optimization problems using simplex method.
- Formulate and solve transportation and assignment problems.
- Apply game theory for decision making problems.

Module - 1

Introduction, Linear Programming: Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation .

Introduction to Linear Programming Problem (LPP): Prototype example, Assumptions of LPP, Formulation of LPP and Graphical method various examples. **08 Hours**

Module - 2

Simplex Method – 1: The essence of the simplex method; Setting up the simplex method; Types of variables, Algebra of the simplex method; the simplex method in tabular form; Tie breaking in the simplex method, Big M method, Two phase method.
08 Hours

Module - 3

Simplex Method – 2: Duality Theory - The essence of duality theory, Primal dual relationship, conversion of primal to dual problem and vice versa. The dual simplex method **08 Hours**

Module - 4

Transportation and Assignment Problems: The transportation problem, Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel's Approximation Method. Optimal solution by Modified Distribution Method (MODI). The Assignment problem; A Hungarian algorithm for the assignment problem. Minimization and Maximization varieties in transportation and assignment problems. **08 Hours**

Module - 5

Game Theory: Game Theory: The formulation of two persons, zero sum games; saddle point, maximin and minimax principle, Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure.
Metaheuristics: The nature of Metaheuristics, Tabu Search, Simulated Annealing, Genetic Algorithms.
08 Hours

Course Outcomes: At the end of the course, students will be able to:

- Select and apply optimization techniques for various problems.
- Model the given problem as transportation and assignment problem and solve.
- Apply game theory for decision support system.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Operations Research	D.S. Hira and P.K. Gupta	y S. Chand & Company Ltd, 2014	2014
Reference Books				
1	Operation Research	S Kalavathy	Vikas Publishing House Pvt Limited	01-Aug-2002
2	Operation Research	S D Sharma	Kedar Nath Ram Nath Publishers.	

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

BUSINESS COMMUNICATION ANDVALUE SCIENCE – II

Course Code	**18CB53**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Objectives: This course will enable students

- Develop effective writing, reading, presentation and group discussion skills. Motivate students to look within and create a better version of self. Help students identify personality traits and evolve as a better team player.
- Introduce them to key concepts of Morality, Behavior and beliefs and Diversity & Inclusion Identification of common errors in written communication and ways of rectification
- Understanding speed reading techniques – Skimming and Scanning, application of reading and writing skills, Analyzing personality traits and team player style and understanding the concepts of Morality, Diversity and Inclusion
- Creation of communication material and Experiencing diversity and organizing events to support inclusion

Module - 1

Identification of common errors in written communication and ways of rectification - Understanding speed reading techniques – Skimming and Scanning - Application of reading and writing skills.

10Hours

Module - 2

Analyzing personality traits - team player style - Understanding the concepts of Morality - Diversity and Inclusion - Application of these concepts.

10Hours

Module - 3

Creation of communication material – Experiencing diversity - Organizing events to support inclusion - Assignment – Assimilation of concepts and present them effectively.

10Hours

Module - 4

Self - Assessment, Self - Appraisal, SWOT, Goal setting - Personal & career- Self-Assessment, SelfAwareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self - appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, and prioritization.

10Hours

Module - 5

Corporate grooming and dressing, etiquettes in social and office Setting-Understand the importance of professional behavior at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities

10 Hours

Course Outcomes: At the end of the course, students will be able to:

- Understand tools of structured written communication and basics of presentation skills.
- Apply the basic concept of speed reading, skimming and scanning.
- Understand and identifying the individual personality types and their role in a team along with the concept of morality and diversity.
- Recognize the concept of outward behavior and internal behavior.
- Organize an event to generate awareness and get support for a cause through communicative ability.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Advertising & IMC: Principles and Practice	Sandra Moriaty, Nancy D. Mitchell, William D.Wells	Pearson Education India	15 June 2016
2	Start With Why: How Great Leaders Inspire Everyone to Take Action	Simon Sinek	Penguin Publishers.	2011
3	Abundance: The Future is Better Than You Think	Peter H. Diamandis & Steven Kotler	Simon & Schuster.	2012

Reference Books

1. Dr. A.P.J. Abdul Kalam, & Arun Tiwari, "Guiding Souls: Dialogues on the purpose of life", Ocean Books Pvt. Ltd, 2005.
2. Dr. A.P.J. Abdul Kalam & Acharya Mahapragya, "The Family and the Nation", HarperCollins Publishers India, a joint venture with India Today, New Delhi, 2015.
3. Dr. A.P.J Abdul Kalam & Y.S. Rajan, "The Scientific Indian: A Twenty First Century Guide to the World Around Us", Penguin Viking, 2011.
4. Dr.A.P.J. Abdul Kalam, "Forge Your Future: Candid, Forthright, Inspiring", Rajpal & Sons, 2014

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

EMBEDDED SYSTEMS WITH INTERNET OF THINGS

Course Code	**18CB54**	**CIE Marks**	**40**
Teaching Hours/Week(L:T:P)	**3:0:0**	**SEE Marks**	**60**
Credits	**03**	**Exam Hours**	**03**

Course Objectives:

- Identify the Building Blocks of the Embedded System and its development strategies.
- Embedded systems are designed to perform a small number of tasks efficiently.
- Illustrate diverse methods of deploying smart objects and connecting them to the network.
- The programming approach for 8-bit microcontrollers is simple and its design is less complicated which is useful for processing real world signals.
- Determine Sensor technologies for sensing real-world entities and understand the role of IoT in various domains of the Industry.

Module - 1

Introduction to embedded systems: Embedded system, Embedded systems vs. General Computing Systems, Classification of embedded systems, major application areas of embedded systems, purpose of embedded systems. The typical embedded system: core of the embedded system, memory, sensors and actuators, communication interface.

TextBook:T1 **08 Hours**

Module - 2

Characteristics and Quality attributes of embedded systems: Characteristics and Quality attributes of embedded systems. Embedded systems-Application- and Domain Specific: Washing machine, automotive-domain specific examples of embedded system.

TextBook:T1 **08 Hours**

Module - 3

Smart Objects: The "Things" in IoT Sensors- Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

TextBook:T2 **08 Hours**

Module - 4

Designing embedded systems with 8bit Microcontrollers: Factors to be considered in selecting a controller, why 8051 microcontroller, designing with 8051. Programming the 8051 microcontroller: different addressing modes supported by 8051, the 8051 instruction set. Hardware software co-design and program modeling: fundamental issues in hardware software co-design, Computational models in embedded design.

TextBook:T1 **08 Hours**

Module - 5

IP as the IoT Network Layer: The Business Case for IP, The need for optimization. Application protocols for IoT: The transport layer, IoT application transport methods: Application layer protocol not present, SCADA, a little background on SCADA, IoT application layer protocols.

TextBook:T2 **08 Hours**

Course Outcomes:

- Describe the real time embedded system and its components.
- Understand basic components and building blocks of Internet of Things.
- Compare and contrast the deployment of smart objects and the technologies to connect them to the network.
- Apply skills to conduct component interfacing for embedded boards.
- Describe the protocol and communications standards of IOT using embedded systems.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Introduction to Embedded Systems	SHIBU K V	McGraw Hill Education private Limited	2013
2	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	Cisco Press	1st Edition
Reference Books				
1	Internet of Things (A Hands-on Approach)	Vijay Madisetti and ArshdeepBahga	Universities Press	1st Edition

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

DATABASE MANAGEMENT SYSTEMS

Course Code	**18CB55**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Provide a strong foundation in database concepts, technology, and practice.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems

Module - 1

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures:** Data Models Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. **Conceptual Data Modelling using Entities and Relationships:** Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization

Textbook: T1 **8Hours**

Module – 2

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas Update operations, transactions, and dealing with constraint violations. **Relational Algebra:** Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. **Mapping Conceptual Design into a Logical Design:** Relational Database Design using ER-to-Relational mapping.

Textbook: T1 **8Hours**

Module - 3

SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT DELETE, and UPDATE statements in SQL, Additional features of SQL.

SQL : Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. **Database Application Development:** Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. **Internet Applications:** The three-Tier application architecture, The presentation layer, The Middle Tier

Textbook: T1 **8Hours**

Module - 4

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. **Normalization Algorithms:** Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs

Textbook: T1 **8Hours**

Module - 5

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL**. Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques.

Textbook:1 **8Hours**

Course Outcomes: At the end of the course, students will be able to:

- Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.
- Use Structured Query Language (SQL) for database manipulation.
- Design and build simple database systems
- Develop application to interact with databases.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Fundamentals of Database Systems	Ramez Elmasri and Shamkant B. Navathe	Pearson.	7th Edition, 2017
2	Database management systems	Ramakrishnan, and Gehrke	McGraw Hill	3rd Edition, 2014
Reference Books				
1	Database System Concepts	Silberschatz Korth and Sudharshan	Mc-GrawHill	6th Edition

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

BUSINESS STRATEGY

Course Code	**18CB56**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- This course aims to develop students' understanding of the strategic management by clearly explaining strategy concepts, analyzing and evaluating them to show how these are applied in the business world.

Module - 1

Introduction : Concept and importance of strategic management, importance of strategic decisions, elements of strategic management, Need for strategy, company values, levels of strategy, strategic management process, changes in the approach to strategic management, different perspectives on strategy formulation, concept and features of strategic planning.

TextBook:T1 **7Hours**

Module – 2

Developing strategic vision, communicating the strategic vision, crafting a mission statement, linking vision and mission with company values, levels of objectives, crafting objectives.

TextBook:T1 **7Hours**

Module - 3

Concept, the general environment; scanning, monitoring and forecasting the environment, Scenario planning, PEST analysis; The competitive environment- Porter's Five Forces Framework, the value net, strategic groups hypercompetition, Internal environment analysis- value-chain-analysis, evaluating Value chain, SWOT analysis, concept of internal environment, the resource-based view of strategy- resources, competencies, core competencies and distinctive capabilities; identifying sustainable competitive advantage, criticism of resource-based view, knowledge management.

TextBook:T1 **9Hour**

Module - 4

Concept, Business level strategy- Generic competitive strategies, a resource-based view to strategy formulation, the industry life-cycle; corporate level strategies- Growth strategies, related and unrelated diversification, implementing growth strategies, portfolio analysis- Boston Consulting Group Matrix and The General Electric-Mckinsey Matrix strategy evaluation.

TextBook:T2 **9Hours**

Module - 5

Concept, organizational structures- the entrepreneurial, functional, divisional, matrix and network, strategic leadership, leadership and management, the learning organization, emotional intelligence and leadership performance, leadership capabilities, impact of leadership on vision, values and culture, corporate culture and leadership, leading strategic change.

TextBook:T2 **8Hours**

Course Outcomes: At the end of the course, students will be able to:

- Understand the nature of competition and industries at an advanced level.
- Understand how external forces such as social, political/legal, economic, and technological,influence strategic decision-making and firm performance.
- Understand the sophisticated relationships among the functional areas of an organization (marketing, human resources, production, finance, and accounting) and how effective strategic planning requires a concerted effort among all functional areas.
- Understand strategy research, including extensive use of the internet as a research tool.
- Apply the strategic management model to the analysis of an ongoing enterprise, including industry environmental, and firm assessments; firm, business, and functional strategic assessments; development and evaluation of strategic alternatives; and strategic implementation and control.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Strategic Management: Formulation, Implementation and Control,	Pearce II, J.A., Robinson R.B and Mittal, A.	McGraw Hill.	-
2	Crafting and Executing Strategy,	Thompson, A. Peteraf, M.A., Gamble, J.E., Strickland, A.J., and Jain A.K.	McGraw Hill	-

Reference Books

1. Kajmi, A. Business Policy and Strategic Management, Tata McGraw Hill Adhikari, D.R. Strategic Management, Buddha Publication
2. Wheelan, T.L. and Hunger J.D. Strategic Management and Business Policy, Pearson
3. Henry, E.A. Understanding Strategic Management, Oxford
4. Jauch, L.R. and Glueck, W.F. Business Policy and Strategic Management, McGraw-Hill.

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

ELECTRONICS AND IoT LABORATORY

Course Code	18CBL57	CIE Marks	40
Teaching Hours/Week (L:T:P)	0:2:2	SEE Marks	60
Credits	2	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Develop and test Program using Arduino / Raspberry Pi
- Conduct the experiments on different Sensors

Experiments List:

1. Familiarization with the concept of IOT, Arduino / Raspberry Pi and perform necessary software installation
2. Study of different operating systems for Raspberry Pi / Beagle board. Understanding the process of OS installation on Raspberry – Pi/ Beagle board
3. Study of Connectivity and Configuration of Raspberry-Pi/ Beagle Board circuit with basic peripherals, LEDs, Understanding GPIO and its use in program
4. Use of the Temperature Sensors and LED
5. Use of Infrared Sensors and LED
6. To blink the light the LED, use the push buttons switch.
7. To blink the light the LED, use the Photo Resistor.
8. program for switching LED/Light based on reading LDR(Light Sensor) reading
9. To turn on /off LED using the Touch Sensor.
10. To measure the moisture of soil using soil & moisture sensor.
11. To turn on/off the LED using DS18B20 sensors.
12. Measure the temp and humidity using DS18B20 sensors.
13. To study and demonstrate the pairing of Arduino / Raspberry Pi board with Blue tooth module HC-05.

Laboratory Outcomes: The student should be able to:

- Analyze the Arduino / Raspberry Pi
- Demonstrate the working of different concepts of sensors
- Implement, analyze and evaluate different sensors

Conduct of Practical Examination:

- Experiment distribution
- For laboratories having only one part: Students are allowed to pick one experiment fromthe lot with equal opportunity.
- For laboratories: Students are allowed to pick one experiment
- Change of experiment is allowed only once and marks allotted for procedure to be made zero ofthe changed part only.
- Marks Distribution *(Courseed to change in accoradance with university regulations)*
  i) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks

DATABASE LABORATORY			
Course Code	**18CBL58**	**CIE Marks**	40
Number of Contact Hours/Week	0:2:2	**SEE Marks**	60
Credits	2	**Exam Hours**	03

Course Learning Objectives: This course (18CBL58) will enable students to:

- Foundation knowledge in database concepts, technology and practice to groom students into well-informed database application developers.
- Strong practice in SQL programming through a variety of database problems.
- Develop database applications using front-end tools and back-end DBMS.

Descriptions (if any):

PART-A: SQL Programming (Max. Exam Mks. 50)

- Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment.
- Create Schema and insert at least 5 records for each table. Add appropriate databaseconstraints.

PART-B: Mini Project (Max. Exam Mks. 30)

- Use Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web based application (Mobile apps on Android/IOS are not permitted.)

Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.

Programs List:

PART A

1.	Consider the following schema for a Library Database: BOOK(Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS(Book_id, Author_Name) PUBLISHER(Name, Address, Phone) BOOK_COPIES(Book_id, Programme_id, No-of_Copies) BOOK_LENDING(Book_id, Programme_id, Card_No, Date_Out, Due_Date) LIBRARY_PROGRAMME(Programme_id, Programme_Name, Address) Write SQL queries to 1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017. 3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library.
2.	Consider the following schema for Order Database: SALESMAN(Salesman_id, Name, City, Commission) CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) Write SQL queries to 1. Count the customers with grades above Bangalore‟s average.

	2. Find the name and numbers of all salesman who had more than one customer. 3. List all the salesman and indicate those who have and don‟t have customers in their cities (Use UNION operation.) 4. Create a view that finds the salesman who has the customer with the highest order of a day. 5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.
3.	Consider the schema for Movie Database: ACTOR(Act_id, Act_Name, Act_Gender) DIRECTOR(Dir_id, Dir_Name, Dir_Phone) MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST(Act_id, Mov_id, Role) RATING(Mov_id, Rev_Stars) Write SQL queries to 1. List the titles of all movies directed by „Hitchcock‟. 2. Find the movie names where one or more actors acted in two or more movies. 3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation). 4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title. 5. Update rating of all movies directed by „Steven Spielberg‟ to 5.
4.	Consider the schema for College Database: STUDENT(USN, SName, Address, Phone, Gender) SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID) COURSE(Subcode, Title, Sem, Credits) IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA) Write SQL queries to 1. List all the student details studying in fourth semester „C‟ section. 2. Compute the total number of male and female students in each semester and in each section. 3. Create a view of Test1 marks of student USN „1BI15CS101‟ in all Courses. 4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students. 5. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = „Outstanding‟ If FinalIA = 12 to 16 then CAT = „Average‟ If FinalIA< 12 then CAT = „Weak‟ Give these details only for 8th semester A, B, and C section students.
5.	Consider the schema for Company Database: EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate) DLOCATION(DNo,DLoc) PROJECT(PNo, PName, PLocation, DNo) WORKS_ON(SSN, PNo, Hours) Write SQL queries to 1. Make a list of all project numbers for projects that involve an employee whose last name is „Scott‟, either as a worker or as a manager of the department that controls the project. 2. Show the resulting salaries if every employee working on the „IoT‟ project is

	given a 10 percent raise. 3. Find the sum of the salaries of all employees of the „Accounts" department, as well as the maximum salary, the minimum salary, and the average salary in this department 4. Retrieve the name of each employee who works on all the projects controlled bydepartment number 5 (use NOT EXISTS operator). 5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.
PART B: Mini Project	
□	For any problem selected, Make sure that the application should have five or more tables Indicative areas include; health care; e-commerce etc.

Laboratory Outcomes: The student should be able to:

- Create, Update and query on the database.
- Demonstrate the working of different concepts of DBMS
- Implement, analyze and evaluate the project developed for an application.

Conduct of Practical Examination:

- Experiment distribution
  - For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
  - For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution *(Courseed to change in accoradance with university regulations)*
  - k) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks
  - l) For laboratories having PART A and PART B
    - i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
    - ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 6th

COMPUTER NETWORKS

Course Code	**18CB61**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:2:0	SEE Marks	60
Credits	4	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Demonstration of application layer protocols
- Discuss transport layer services and understand UDP and TCP protocols
- Explain routers, IP and Routing Algorithms in network layer
- Disseminate the Wireless and Mobile Networks covering IEEE 802.11 Standard
- Illustrate concepts of Multimedia Networking, Security and Network Management

Module-1

Computer Networks: What is the Internet, The Network Edge, The Network Core, Delay Loss and Throughput in Packet-Switched Networks, Protocol Layers and Their Service Models, Networks Under Attack
T1: Chapter 1.1- 1.6

10 Hours

Module-2

Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution, Distributed Hash Tables, Socket Programming: creating Network Applications: Socket Programming with UDP, Socket Programming with TCP.
T1: Chapter 2

10 Hours

Module-3

Transport Layer : Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round- Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control, TCP Congestion Control: Fairness.
T1: Chapter 3

10 Hours

Module-4

The Network layer: What's Inside a Router?: Input Processing, Switching, Output Processing, Where Does Queuing Occur? Routing control plane, IPv6,A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing

Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast Routing Algorithms and Multicast.

T1: Chapter 4: 4.3-4.7

10 Hours

Module-5

The Link Layer: Links, Access Networks and LAN,s: Introduction to the Link Layer, Error Detection and correction techniques, Multiple Access and Links Protocols, Switched Local Area Networks, Link Virtualization.

T1: Chapter 5.1- 5.5

10 Hours

Course outcomes:

At the end of the course the student will be able to:

- Explain principles of application layer protocols
- Recognize transport layer services and infer UDP and TCP protocols
- Classify routers, IP and Routing Algorithms in network layer
- Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard
- Describe Multimedia Networking and Network Management

Question paper pattern:

- The question paper will have ten questions..
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	Computer Networking, A Top-Down Approach	James F Kurose and Keith W Ross	Pearson	6th Edition, 2017
2	Computer and Communication Networks	Nader F Mir	Pearson	2nd Edition, 2014
Reference Books				
1	Data and Communications and Networking	Behrouz A Forouzan	Mc-GrawHill	5th Edition
2	Computer Networks	Larry L Peterson and Brusce S Davie	ELSEVIER	5th Edition

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING WITH PYTHON

Course Code	**18CB62**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Objectives: This course will enable students

- Explain Artificial Intelligence and Machine Learning
- Illustrate AI and ML algorithm and their use in appropriate applications

Module - 1

What is artificial intelligence?, Problems, problem spaces and search, Heuristic search techniques
Texbook 1: Chapter 1, 2 and 3
RBT: L1, L2 **10 Hours**

Module – 2

Knowledge representation issues, Predicate logic, Representaiton knowledge using rules. Concpet Learning: Concept learning task, Concpet learning as search, Find-S algorithm, Candidate Elimination Algorithm, Inductive bias of Candidate Elimination Algorithm.
Texbook 1: Chapter 4, 5 and 6
Texbook2: Chapter 2 (2.1-2.5, 2.7)
RBT: L1, L2, L3 **10 Hours**

Module – 3

Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems, ID3 algorith. Aritificil Nueral Network: Introduction, NN representation, Appropriate problems, Perceptrons, Backpropagation algorithm.
Texbook2: Chapter 3 (3.1-3.4), Chapter 4 (4.1-4.5)
RBT: L1, L2, L3 **10 Hours**

Module - 4

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting, MDL principle, Bates optimal classifier, Gibbs algorithm, Navie Bayes classifier, BBN, EM Algorithm
Texbook2: Chapter 6
RBT: L1, L2, L3 **10 Hours**

Module - 5

Instance-Base Learning: Introduction, k-Nearest Neighbour Learning, Locally weighted regression, Radial basis function, Case-Based reasoning. Reinforcement Learning: Introduction, The learning task, Q-Learning.
Texbook 1: Chapter 8 (8.1-8.5), Chapter 13 (13.1 – 13.3)
RBT: L1, L2, L3 **10 Hours**

Course Outcomes: At the end of the course, students will be able to:

- Appaise the theory of Artificial intelligence and Machine Learning.
- Illustrate the working of AI and ML Algorithms.
- Demonstrate the applications of AI and ML.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module

Textbooks

1. Tom M Mitchell,“Machine Lerning”,1 st Edition, McGraw Hill Education, 2017.
2. Elaine Rich, Kevin K and S B Nair, “Artificial Inteligence”, 3 rd Edition, McGraw Hill Education, 2017.

Reference Books

1. Saroj Kaushik, Artificial Intelligence, Cengage learning
2. Stuart Rusell, Peter Norving , Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition
3. AurÈlienGÈron,"Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, Shroff/O'Reilly Media, 2017.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
5. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press
6. Srinvivasa K G and Shreedhar, “ Artificial Intelligence and Machine Learning”, Cengage

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 6th

FINANCE AND COST ACCOUNTING

Course Code	**18CB63**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Objectives: This course will enable students

- Engineering Knowledge.
- Problem Analysis.
- Interpretation of Data.

Module - 1

Financial Accounting: Basic Concept – Definitions of Book Keeping and Accounting – Objectives and Functions of Accounting – Types of Accounts – Rules of Debit and Credit, Journal – Ledger – Trial Balance. Preparation of Final Accounts – Adjusting Entry – Trading, Profit and Loss Account and Balance Sheet.

10Hours

Module - 2

Budget - Meaning and definitions – Preparation of Functional Budgets – Cash Budget - Sales Budget – Purchases and Production Budget – Flexible Budget.

Capital Budgeting – Nature, Importance and Objectives – Process involved in Capital Budgeting – Kinds of Capital Budgeting Decision

10Hours

Module - 3

Methods of Evaluating Investment Proposals – Payback method – Payback profitability method – Discounted Cash Flow method – Net present – Value method

10Hours

Module - 4

Costing concepts – Meaning and Definition – Objectives – Difference between Cost of Financial Accounting Cost Classification Statement of Cost and Estimation – Methods of Costing – Job Costing and Process Costing

10Hours

Module - 5

Project Accounts – Preparation of Contract Accounts for each project – Methods of Recording and Reporting Site Accounts to Project Office and from Project Office to Head Office.

10Hours

Course Outcomes: At the end of the course, students will be able to:

- Apply the knowledge of concepts of finance and cost accounting in construction.
- Analyze the financial accounting and cost of construction projects.
- Assess the financial position to investment in a project

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Accounting for Management	Bhattacharya S.K. and Dearden John	Vani Educational Books, Mumbai (Latest Edition).	-
2	Corporate Finance	Kuchal S.C.	Tata McGraw Hill	-

Reference Books

1. Prof. K.S. Nagapathi, "Management Accounting" R. Chand and Co., New Delhi.
2. Saravanvel P. "Management Accounting" Principles and Practices.
3. B.S. Raman "Accountancy".

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
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SEMESTER – 6th

HUMAN RESOURCE MANAGEMENT

Course Code	**18CB641**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Understand managerial roles in human resource affairs;
- Understand HRM approaches to staffing, performance, compensation, and strategic issues;
- Develop a clear understanding of the specific functions and activities of HRM by analyzing real life business problems/issues;
- Provide knowledge of contemporary issues and practical techniques associated with effective practice of HRM.

Module - 1

Perspectives In Human Resource Management: Evolution of human resource management – The importance of the human factor – Challenges – Inclusive growth and affirmative action -Role of human resource manager – Human resource policies – Computer applications in human resource management – Human resource accounting and audit.

8Hours

Module – 2

The Concept Of Best Fit Employee: Importance of Human Resource Planning – Forecasting human resource requirement –matching supply and demand – Internal and External sources. Recruitment – Selection – induction – Socialization benefits.

8Hours

Module – 3

Training and Executive Development: Types of training methods –purpose- benefits- resistance. Executive development programmes – Common practices – Benefits – Self-development – Knowledge management.

8Hours

Module – 4

Sustaining Employee Interest: Compensation Plan – Reward – Motivation – Application Of Theories Of Motivation – Career Management – Development Of Mentor – Protégé Relationships.

8Hours

Module – 5

Performance Evaluation And Control Process: Method Of Performance Evaluation – Feedback – Industry Practices. Promotion, Demotion, Transfer And Separation – Implication Of Job Change. The Control Process – Importance – Methods – Requirement Of Effective Control Systems Grievances – Causes – Implications – Redressal Methods. **8Hours**

Course Outcomes: At the end of the course, students will be able to:

- Apply the knowledge of concepts of finance and cost accounting in construction.
- Analyze the financial accounting and cost of construction projects.
- Assess the financial position to investment in a project
- Understand HRM approaches to staffing
- Understand managerial roles in human resource affairs;
- Provide knowledge of contemporary issues and practical techniques associated with effective practice of HRM.
- Performance, compensation, and strategic issues; Develop a clear understanding of the specific functions and activities of HRM by analyzing real life business problems/issues;

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Human Resource Management	Gary Dessler, Biju Varkkey,	Pearson Prentice Hall	11th Edition
2	Human Resource Management	H John Bernardin	Tata McGraw Hill	4th edition 2010.
Reference Books				

1. Decenzo and Robbins, "Human Resource Management", Wiley

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
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SEMESTER – 6th

INTRODUCTION TO INNOVATION IP MANAGEMENT AND ENTREPRENEURSHIP

Course Code	**18CB642**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Understand the strategic and innovation related IP management practices.
- To develop managerial and economic frameworks, models, and tools to be used in the intersection between IP management and open innovation practices.
- Understanding the special challenges of starting new ventures.
- To use IPR as an effective tool to protect their innovations and intangible assets from exploitation.

Module - 1

Innovation: Innovation as a core business process, Sources of innovation, Knowledge push vs need pull innovations.
Building an Innovative Organization: Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture.
Textbook: T1 **08 Hours**

Module - 2

Entrepreneurship: Opportunity recognition and entry strategies Entrepreneurship as a Style of Management, Maintaining Competitive Advantage- Use of IPR to protect Innovation
Textbook: T1 **08 Hours**

Module – 3

Entrepreneurship- Financial Planning: Financial Projections and Valuation, Stages of financing. Debt, Venture Capital and other forms of Financing
Textbook: T1 **08 Hours**

Module – 4

Intellectual Property Rights (IPR): Introduction and the economics behind development of IPR-Business Perspective, IPR in India – Genesis and Development, International Context, Concept of IP Management, Use in marketing.
Textbook: T1 **08 Hours**

Module – 5

Types of Intellectual Property: Patent-Procedure, Licensing and Assignment, Infringement and Penalty, Trademark-Use in marketing, example of trademarks- Domain name, Geographical Indications- What is GI, Why protect them? Copyright- What is copyright, Industrial Designs, What is design? How to protect?
Case Study: Major Court battles regarding violation of patents between corporate companies.
Textbook: T1 **08 Hours**

Course Outcomes: At the end of the course, students will be able to:

- To be familiar with creative and innovative thinking styles.
- Proficiency in opportunity reorganization and entrepreneurship skills.
- Learn to manage various types of IPR to protect competitive advantage.
- Understand the types of IP.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Managing Innovation: Integrating Technological, Market and Organizational Change	Joe Tidd, John Bessant	Wiley	7th edition, 2021
Reference Books				
1	Innovation and Entrepreneurship Theory, Policy and Practice	Elias G. Carayannis Elpida T. Samara Yannis L. Bakouros	Springer	2015 print

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
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SEMESTER – 5th

ADVANCED JAVA AND J2EE

Course Code	**18CB643**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Identify the need for advanced Java concepts like Enumerations and Collections
- Construct client-server applications using Java socket API
- Make use of JDBC to access database through Java Programs
- Adapt servlets to build server side programs
- Demonstrate the use of JavaBeans to develop component-based Java software

Module - 1

MULTITHREADED PROGRAMMING: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities.

ENUMERATIONS, AUTOBOXING: Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning.

RBT: L1, L2, L3 **8 Hours**

Module – 2

THE COLLECTIONS AND FRAMEWORK: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, String Handling :The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString( ) Character Extraction, charAt( ), getChars( ), getBytes( ) toCharArray(), String Comparison, equals( ) and equalsIgnoreCase( ), regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods.

RBT: L1, L2, L3 **8 Hours**

Module – 3

INTRODUCING SWING: The Origins of Swing, Swing Is Built on the AWT, The MVC Connection, Components and Containers, The Swing Packages, A Simple Swing Application

SERVLETS: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses;

RBT: L1, L2, L3 **8 Hours**

Module - 4

NETWORKING: Networking Basics, The Networking Classes and Interfaces, InetAddress, Inet4Address and Inet6Address, TCP/IP Client Sockets, URL, URL Connection, HttpURL Connection, TCP/IP Server Sockets

JSP,RMI: Java Server Pages(JSP): JSP, JSP tags, Tomcat, Request String, User sessions, Cookies, Session

Objects. Java Remote Method Invocation: RMI concept; Server side, Client side.
RBT: L1, L2, L3 **8 Hours**

Module - 5

THE CONCEPT OF JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.
RBT: L1, L2, L3 **8 Hours**

Course Outcomes: At the end of the course, students will be able to:

- Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs.
- Build client-server applications and TCP/IP socket programs
- Illustrate database access and details for managing information using the JDBC API
- Describe how servlets fit into Java-based web application architecture
- Develop reusable software components using Java Beans

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module

Textbooks

1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.
2. Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.

Reference Books

7. Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007.
8. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
9. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.
10.

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
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SEMESTER – 6th

EXPERT SYSTEM AND DECISION SUPPORT SYSTEM

Course Code	**18CB644**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Introduce the concepts of Expert Systems
- Introduce the concepts of Decision Support Systems

Module - 1

Introduction to Expert Systems : Introduction, What is an Expert System?, Advantages of Expert Systems, General Concepts of Expert Systems, Characteristics of an Expert System,

Textbook: T1 **8Hours**

Module - 2

The Development of Expert Systems Technology, Expert Systems Applications and Domains, Languages, Shells, and Tools, Elements of an Expert System, Production Systems, Procedural Paradigms, Nonprocedural Paradigms

Textbook: T1 **8Hours**

Module - 3

Decision Making and Computerized Support, Decision Support Systems

Textbook: T2 (Ch:1,2,3,4,5,6) **8Hours**

Module - 4

Collaboration, communication, enterprise decision support systems, and knowledge management.

Textbook: T2 (Ch:7,8,9) **8Hours**

Module - 5

Implementation, integration, and impacts

Textbook: T2 (Ch:18-19) **8Hours**

Course Outcomes: At the end of the course, students will be able to:

- Ability to design expert system using AI tools.
- Ability to design and develop expert system using Machine Learning.
- The process of managerial decision making and modeling.
- Databases, data warehouses, data analysis, and visualization.
- The process of developing DSS.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Introduction to Expert systems	Peter Jackson	Pearson Education	2004
2	Decision Support Systems and Intelligent Sy stems	Efraim Turban and Jay E. Aronson	Prentice Hall	Sixth Edition
Reference Books				
1	Expert Systems Design and Development	Durkin.J	Prentice Hall	1994
2	Introduction to Artificial Intelligence and Expert systems	Dan.W.Patterson	Prentice Hall	2003

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SEMESTER – 6th

SOFT AND EVOLUTIONARY COMPUTING

Course Code	**18CB645**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Basics of artificial neural network..
- Concepts of modelling and control of neural and fuzzy control schemes.
- Features of hybrid control schemes.

Module - 1

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

Textbook: T1 **8Hours**

Module - 2

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.

Textbook: T1 **8Hours**

Module - 3

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

Textbook: T2 **8Hours**

Module - 4

Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.

Textbook: T2 **8Hours**

Module - 5

Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron– GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to other evolutionary optimization techniques, support vector machine– Case study – Familiarization with ANFIS toolbox.

Textbook: T2 **8Hours**

Course Outcomes: At the end of the course, students will be able to:

- Ability to understand the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes.
- Ability to understand the basics of artificial neural network.
- Ability to get knowledge on modelling and control of neural.
- Ability to get knowledge on modelling and control of fuzzy control schemes.
- Ability to acquire knowledge on hybrid control schemes.
- Ability to understand the concepts of Adaptive Resonance Theory

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Fundamentals of Neural Networks	Laurence Fausett	Prentice Hall, Englewood Cliffs, N.J.,	1992
2	Fuzzy Logic with Engineering Applications	Timothy J. Ross	McGraw Hill Inc	-
Reference Books				
1	Genetic Algorithm in Search, Optimization and Machine learning	Goldberg	Addison Wesley Publishing Company Inc.	1989
2	Neural Networks for Control	Millon W.T., Sutton R.S. and Webrose P.J.	MIT press	1992

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
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SEMESTER – 6th

INTRODUCTION TO BUSINESS COMMUNICATION AND VALUE SCIENCE

Course Code	**18CB651**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objective: This course will enable students

- The course aims to augment student's overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals.
- The English language topics for this semester focus on the development of basic fluency in English, usage of words and also introduce them to the concept and importance of interpersonal skills so as to effectively present their personalities.

Module - 1

Essential Grammar – I: Tenses: Basic forms and use, sentence formation (general & Technical), Common errors, Parts of speech through context, Direct and reported speech structures and voices.
Vocabulary Enrichment: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary

08 Hours

Module – 2

Phonetic: Pronunciation, Reduction of MTI in spoken English, Question formation with emphasis on common errors made during conversation
Written Communication – I: Letter Writing –Formal and Informal letter writing, Application letters, Report writing academic and business report, Job application letter

08 Hours

Module - 3

Communication Skills: Importance of effective communication, types of communication- verbal and non - verbal, barriers of communication, effective communication, Listening Skills: Law of nature- Importance of listening skills, Difference between listening and hearing, Types of listening.

08 Hours

Module - 4

Self - Awareness & Self Development: Self - Assessment, Self - Appraisal, SWOT, Goal setting - Personal & career- Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self - appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, and prioritization.
Socio-Cultural and Cross-Cultural Sensitivities at the Workplace: What is Inclusion? Women's contributions in Industry, work issues faced by women, what is sexual harassment, what is appropriate behavior for everyone at work.

08 Hours

Module - 5

Interpersonal Skills – I: Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development Team Problem Solving, Building the team dynamics. Multicultural team activity 18 Computer Science and Business Systems.
Time Management: The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritize using decision matrices, to beat the most common time wasters, how to plan, how to handle interruptions, to maximize your personal effectiveness, how to say "no" to Time wasters.

Values of a good manager: Understanding Corporate Values and behavior; Personal / Human Values; Pride and grace in Nationalist.

08 Hours

Course Outcomes: At the end of the course, students will be able to:

- Speak fluently in English without errors in tenses and hence present themselves as effective English communicators. They will be able to learn the 12 tenses and use them appropriately.
- Differentiate between active and passive vocabulary and be able to use the 60 words discussed in class for their daily conversation and 40 words also given as assignments.
- The ability to process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 100-150 words for paragraph writing.
- Present them in a certain manner by using the 50-55 phrases discussed in class appropriately for group discussions, personal interviews during the campus recruitment process/competitive exams.
- Enhance their communication skills by acquainting with the 2 important aspects of communication and helping them to overcome the 10 most common barriers of communication. Learn the 7 different types of listening skills; differentiate effective listening skills and understand the importance of it through 5 activities held in class and implement them in professional life.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Business Communication	Dr. Saroj Hire math	Tata Mc Graw – Hill.	2 ndEdition, 2012
2	English vocabulary in use	Alan McCarthy and O'Dell	Pristine Publishing House, Mangalore	3 rdEdition, 2018

Reference Books

1. Strategic Writing by Charles Marsh
2. The Seven Basic Plots by Christopher Booker

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 6th

Introduction to Statistical Software (MATLAB and SPSS)

Course Code	**18CB652**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- To use statistical software include being free from manual tasks, saving time, dealing with large amounts of data, having more flexibility, and obtaining valid and reliable results.
- Integrate all the data sets from different parts of the business and then get insights that can help to make decisions that are most appropriate for the specific situation.
- Data sets from across the business can be analyzed using different approaches.
- Data cleansing is done when the analytics software automatically cleans the data sets of invalid records and out-of-date information.

Module - 1

Introduction, What Is Statistical Learning? Why Estimate f? How Do We Estimate f? The Trade-Off Between Prediction Accuracy and Model Interpretability, Supervised Versus Unsupervised Learning Regression Versus Classification Problems.
Assessing Model, Measuring the Quality of Fit, The Bias-Variance Trade-Off , The Classification Setting.
Textbook: T1 **10 Hours**

Module - 2

Linear Regression : Simple Linear Regression, Estimating the Coefficients , Assessing the Accuracy of the Coefficient Estimates, Assessing the Accuracy of the Model , Multiple Linear Regression , Estimating the Regression Coefficients .
Case Study: Linear Regression - Libraries , Simple Linear Regression , Multiple Linear Regression , Non-linear Transformations of the Predictors , Qualitative Predictors, Writing Functions.
Textbook: T1 **08 Hours**

Module - 3

Classification: An Overview of Classification, Why Not Linear Regression, Logistic Regression, The Logistic Model Estimating the Regression Coefficients , Making Predictions , Multiple Logistic Regression, Logistic Regression for Response.
Case Study: The Stock Market Data, Logistic Regression
Textbook: T1 **08 Hours**

Module – 4

Resampling Methods: Cross-Validation -The Validation Set Approach , Leave-One-Out Cross-Validation, k-Fold Cross-Validation , Bias-Variance Trade-Off for k-Fold.
Case Study: The Validation Set Approach , Leave-One-Out Cross-Validation , k-Fold Cross-Validation
Textbook: T1 **08 Hours**

Module – 5

Tree-Based Methods : The Basics of Decision Trees , Regression Trees , Classification Trees, Trees Versus Linear Models , Advantages and Disadvantages of Trees, Bagging, Random Forests, Boosting .
Textbook: T1 **08 Hours**

Case studies must be carried out in MATLAB

Course Outcomes: At the end of the course, students will be able to:

- Understand the basics of Matlab
- Break a complex task up into smaller, simpler tasks.
- Gain proficiency in using statistical software for data analysis.
- Undrstand the concepts of Regression, classification, Resampling, Tree-based methods for data analysis.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	An Introduction to Statistical Learning	Gareth James Daniela Witten Trevor Hastie Robert Tibshirani	Springer	8th edition, 2017
2	Differential Differential Equations Equations And Boundary And Boundary Value Problems	C. Henry Edwards David E. Penney, David Calvis	Pearson	5th Edition
Reference Books				
1.	MATLAB for Beginners (A Gentle Approach)	Peter I. Kattan	Petra Books	-

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 6th

INTRODUCTION TO WEB TECHNOLOGY

Course Code	**18CB653**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Illustrate the Semantic Structure of HTML and CSS
- Compose forms and tables using HTML and CSS
- Design Client-Side programs using JavaScript and Server-Side programs using PHP
- Infer Object Oriented Programming capabilities of PHP
- Examine JavaScript frameworks such as jQuery and Backbone

Module - 1

Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.

Textbook: T1 **08 Hours**

Module - 2

HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.

Textbook: T1 **08 Hours**

Module - 3

JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions.

Textbook: T1 **08 Hours**

Module - 4

PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling.

Textbook: T1 **08 Hours**

Module - 5

Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript PseudoClasses, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone 10 MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services

Textbook:1 **08 Hours**

Course Outcomes: At the end of the course, students will be able to:

- Adapt HTML and CSS syntax and semantics to build web pages.
- Construct and visually format tables and forms using HTML and CSS
- Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
- Appraise the principles of object oriented development using PHP
- Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Fundamentals of Web Development	Randy Connolly, Ricardo Hoar	Pearson Education India	1st Edition
Reference Books				
1	Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5	Robin Nixon	O"Reilly Publications	4th Edition
2	PHP and MySQL Web Development	Luke Welling, Laura Thomson	Pearson Education	5th Edition

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – 6th

COMPUTER NETWORK LABORATORY

Course Code	18CBL66	CIE Marks	40
Teaching Hours/Week (L:T:P)	0:2:2	SEE Marks	60
Credits	2	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Demonstrate operation of network and its management commands
- Simulate and demonstrate the performance of GSM and CDMA
- Implement data link layer and transport layer protocols

Descriptions (if any):

- For the experiments below modify the topology and parameters set for the experiment and take multiple rounds of reading and analyze the results available in log files. Plot necessary graphs and conclude. Use NS2/NS3.
- **Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.**

Programs List:

	PART A
1.	Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
2.	Implement transmission of ping messages/trace route over a network topology consisting of 6nodes and find the number of packets dropped due to congestion.
3.	Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
4.	Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.
5.	Implement and study the performance of GSM on NS2/NS3 (Using MAC layer) or equivalent environment.
6.	Implement and study the performance of CDMA on NS2/NS3 (Using stack called Call net)or equivalent environment
	PART B (Implement the following in Java)
7.	Write a program for error detecting code using CRC-CCITT (16- bits).
8.	Write a program to find the shortest path between vertices using bellman-ford algorithm.
9.	Using TCP/IP sockets, write a client – server program to make the client send the file nameand to make the server send back the contents of the requested file if present.
10.	Write a program on datagram socket for client/server to display the messages on client side,typed at the server side.
11.	Write a program for simple RSA algorithm to encrypt and decrypt the data.
12.	Write a program for congestion control using leaky bucket algorithm.

Laboratory Outcomes: The student should be able to:

- Analyze and Compare various networking protocols.
- Demonstrate the working of different concepts of networking.
- Implement, analyze and evaluate networking protocols in NS2 / NS3 and JAVA programming language

Conduct of Practical Examination:

- Experiment distribution

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING WITH PYTHON LABORATORY

Course Code	**18CBL67**	**CIE Marks**	40
Number of Contact Hours/Week	0:2:2	**SEE Marks**	60
Total Number of Lab Contact Hours	36	**Exam Hours**	03

Credits – 2

Course Learning Objectives: This course (18CBL67) will enable students to:

- **Implement and evaluate AI and ML algorithms in and Python programming language.**

Descriptions (if any):
Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.

Programs List:

PART A

1	Implement A* Search algorithm.
2	Implement AO* Search algorithm.
3	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
4	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
6	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
8	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
9	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Laboratory Outcomes: The student should be able to:

- Implement and demonstrate AI and ML algorithms.
- Evaluate different algorithms.

Conduct of Practical Examination:

- Experiment distribution
  - For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
  - For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution *(Courseed to change in accoradance with university regulations)*
  - k) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks
  - l) For laboratories having PART A and PART B
    - i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
    - ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

BUSINESS INTELLIGENCE AND DATA ANALYTICS

Course Code	**18CB71**	CIE Marks	40
Teaching Hours / Week (L:T:P)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Objectives: This course will enable students

- Explain the Decision Support systems and Business Intelligence framework.
- Illustrate the significance of computerized Decision Support, and understand the mathematical modelling behind decision support.
- Explain Data warehousing, its architecture and Extraction, Transformation, and Load (ETL) Processes.Explore knowledge management, explain its activities, approaches and its implementation.
- Understand the knowledge of mathematics to explain the concept of data Analytics.
- Design Supervised and unsupervised ML to predict the class for a given data.

Module - 1

Decision Support and Business Intelligence: Opening Vignette, Changing Business Environments andComputerized Decision Support, Managerial Decision Making, Computerized Support for Decision Making, AnEarly Framework for Computerized Decision Support, The Concept of Decision Support Systems (DSS), Aframework for Business Intelligence (BI), A Work System View of Decision Support.
Text Book 1: Chapter 1
RBT: L1, L2

08 Hours

Module - 2

Computerised Decision Support: Decision Making, Models, Phases of the DecisionMaking Process, TheIntelligence Phase, The Design Phase, The Choice Phase, The Implementation Phase, How Decisions AreSupported.Modelling and Analysis:Structure of Mathematical Models for Decision Support, Certainty, Uncertainty, andRisk, Management Support Systems, Multiple Goals, Sensitivity Analysis, What-If Analysis, andGoal Seeking
Text Book 1: Chapter 2
RBT: L1, L2

08 Hours

Module - 3

Data Warehousing: Data Warehousing Definitions and Concepts, Data Warehousing Process Overview, DataWarehousing Architectures, Data Integration and the Extraction, Transformation, and Load (ETL) Processes.
Text Book 1: Chapter 5
RBT: L1, L2

08 Hours

Module - 4

SciPy Library for statistics: Basic statistics, Parameter techniques for computing means, Non parameter techniques for computing means, The ndimage sub-package. Time series object, Determining stationarity, making time series Stationary, ARIMA modelling
Text Book 3: Chapter 9, Chapter 11
RBT: L3, L4

08 Hours

Module - 5

Supervised Machine learning Ensemble techniques: Bagging, random Forest, Extra trees, Ada Boosting, Gradient Boosting
Text Book 3: Chapter 15
RBT: L3, L4

08 Hours

Course Outcomes: At the end of the course, students will be able to:

- Apply the basics of data and business to understand Decision Support systems and Business Intelligence framework.
- Describe the significance of 106omputerized Decision Support, apply the basics of mathematics to understand the mathematical modelling behind decision support.
- Explain Data warehousing, its architecture and Extraction, Transformation, and Load (ETL) Processes.
- Apply the knowledge of mathematics to explain the concept of data analytics
- Develop models of supervised and Un supervised ML techniques

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Business Intelligence and Analytics: Systems for decision support	RameshSharda,DursunDelden, Efraim Turban	Pearson	Tenth edition
2	Fundamentals of Business Analytics	R N Prasad, Seema Acharya	Wiley India	2011
3	Data Analytics using Python	Bharti Motwani	Wiley	2020
Reference Books				
1	Data Mining Techniques. ForMarketing, Sales and CustomerRelationshipManagement	Berry M.&Linoff G	Wiley	2004
2	Data Science for Business,	Foster Provost and Tom Fawcett	O'Reilly Media	2013
3	Doing Data Science	Cathy O'Neil and Rachel Schutt	O'Reilly	2014
4	Practical Data Analysis,	Hector Cuesta	PACKT	2013

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

CLOUD COMPUTING

Course Code	**18CB72**	CIE Marks	40
Teaching Hours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	4	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Explain the fundamentals of cloud computing
- Illustrate the cloud application programming and aneka platform
- Contrast different cloud platforms used in industry

Module-1

Introduction ,Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop Force.com and Salesforce.com, Manjrasoft Aneka

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V

Textbook 1: Chapter 1,3

RBT: L1, L2 **10 Hours**

Module-2

Cloud Computing Architecture, Introduction, Cloud Reference Model, Architecture Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects Aneka: Cloud Application Platform, Framework Overview, Anatomy of the Aneka Container, From the Ground Up Platform Abstraction Layer, Fabric Services, foundation Services, Application Services Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools

Textbook 1: Chapter 4,5

RBT: L1, L2 **10 Hours**

Module-3

Concurrent Computing: Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread?, Thread APIs Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model, Domain Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent.

High-Throughput Computing: Task Programming, Task Computing, Characterizing a Task Computing Categories, Frameworks for Task Computing, Task-based Application Models Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependencies, Aneka Task-Based Programming, Task Programming Model, Developing Applications with the Task Model, Developing Parameter Sweep Application, Managing Workflows.

Textbook 1: Chapter 6, 7
RBT: L1, L2 **10 Hours**

Module-4

Data Intensive Computing: Map-Reduce Programming, What is Data-Intensive Computing? Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka MapReduce Programming, Introducing the MapReduce Programming Model, Example Application

Textbook 1: Chapter 8
RBT: L1, L2
10 Hours

Module-5

Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services Communication Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Applications Scientific Applications, Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction Biology: Gene Expression Data Analysis for Cancer Diagnosis, Geoscience: Satellite Image Processing, Business and Consumer Applications, CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.

Textbook 1: Chapter 9,10
RBT: L1, L2 **10 Hours**

Course outcomes:

At the end of the course the student will be able to:

- Explain cloud computing, virtualization and classify services of cloud computing
- Illustrate architecture and programming in cloud
- Describe the platforms for development of cloud applications and List the application of cloud.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi	McGraw Hill Education	
Reference Books				
1	Cloud Computing Theory and Practice	Dan C. Marinescu, Morgan Kaufmann	Elsevier	2013

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

MARKETING MANAGEMENT & MARKETING RESEARCH

Course Code	**18CB731**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: On successful completion of the course, the Students will enable to understand

a) Understand the basic concepts and functions of marketing management and analyse marketing environment impacting the business.

b) Segment the market and understand the consumer behavior and Describe 7 p's of service marketing mix.

c) Describe the 4 p's of marketing and also strategize marketing mix

d) To understand the Introduction to marketing research and sampling design Data collection and data analysis and its presentation

Module – 1: Introduction to marketing and understanding the marketing environment

Introduction to Marketing management, Meaning and Definition, Concepts of Marketing, Approaches to Marketing, Functions of Marketing. Recent trends in Marketing-E- business, Tele-marketing, M-Business, Green Marketing, Relationship Marketing, Concept Marketing, Digital Marketing, social media marketing and E-tailing.

Micro & Macro Environmental analysis – The company, suppliers, marketing intermediaries competitors, public and customers; Macro Environment- Demographic, Economic, Natural, Technological, Political, Legal, Socio-Cultural Environment.

08 Hours

Module – 2 : Market segmentation, consumer behaviour & services marketing

Introduction to market segmentation: Meaning and Definition, Bases of Market Segmentation, Targeting marketing and positioning.

Introduction to Consumer Behavior-Factors influencing Consumer Behavior; Buying Decision Process.

Service marketing: Meaning and definition of services, difference between goods and services, features of services, seven P's of services marketing (only concept to be covered).

08 Hours

Module – 3 Marketing mix

Introduction to Marketing Mix: Meaning, Elements of Marketing Mix (Four P's) – Product, Price, Place Promotion. Product-Product Mix, Product Line, Product Lifecycle, New Product Development, Reasons for Failure of New Product, Branding, Packing and Packaging, Labeling, Pricing – Objectives, Factors influencing Pricing Policy, Methods of Pricing; Physical Distribution–Meaning, Factors affecting Channel Selection, Types of Marketing Channels. Promotion – Meaning and Significance of Promotion, Personal Selling and Advertising (Meaning Only to be covered)

08 Hours

Module – 4: Introduction to marketing research and sampling design

Introduction to marketing research: What is Marketing Research? Scope of Marketing Research, The Stages in the Research Process, Research Design: Formulating the Research Problem, Choice of Research Design, Types of Research Design, Sources of Experimental Errors.

Sample and Sampling Design: Some basic terms, Advantages and Limitation of Sampling, Sampling process, Types of Sampling, Types of Sample Designs, Determining the Sample Size, Sampling

Distribution of the Mean. Scaling Techniques: The concept of Attitude, Difficulty of Attitude Measurement, Types of Scales, and Applications of Scaling in Marketing Research.

08 Hours

Module – 5 : Data collection and data analysis

Data Collection: Secondary Data, Sources of Secondary Data, Primary Data, Collection of Primary Data, Methods of Data Collection- Observation, Questionnaire, Designing of Questionnaire. Data Processing and Tabulation: Editing, Coding and Tabulation.

Data Analysis: Testing of Hypothesis, Measurement of Central Tendency, Dispersion, Univariate Analysis, Multiple Regression, Factor Analysis, Cluster Analysis, Multidimensional Scaling, Conjoint Analysis; Interpretation and Report Writing, Types of Research Reports

08 Hours

Course Outcomes: At the end of the course, students will be able to:

1. Develop an ability to assess the impact of the environment on marketing function.
2. To formulate marketing strategies that incorporate psychological and sociological factors which influence buying
3. Understand concept of Branding, development of product and significance of market segmentation, targeting and positioning, Identifying marketing channels and the concept of product distribution.
4. Comprehend the objectives of Market research & its application in solving marketing problems.
5. Appreciate the use of different data collection methods, sampling design techniques, measurement methods to analyze the data and Generalize and interpret the data with the help of various measurement techniques.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Marketing Management,	Philip Kotler,	Prentice Hall	2014
2	Marketing Research	S.L. Gupta	Google Books	
3	Marketing Management	Saxena, Rajan	Tata-McGraw Hill,New Delhi	
Reference Books				
1	Marketing Research (Text with Cases)	Suja R. Nair	Himalaya Publishing House	2 revised edition 2014
2	Marketing Research,	Nargundkar, Rajendra	McGraw Hill Education.	

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
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SEMESTER – 5th

INTERNET OF THINGS

Course Code	**18CB732**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	02

Course Objectives: This course will enable students

- Assess the genesis and impact of IoT applications, architectures in real world.
- Compare different Application protocols for IoT.
- Infer the role of Data Analytics and Security in IoT.
- Analysis the IoT in business
- Understand the application of IoT in different areas.

Module - 1

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.
Textbook 1: Ch.1, 2 RBT: L1, L2, L3 **08 Hours**

Module - 2

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.
Textbook 1: Ch.5, 6 RBT: L1, L2, L3 **08 Hours**

Module - 3

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment
Textbook 1: Ch.7, 8 RBT: L1, L2, L3 **08 Hours**

Module - 4

IoT in Industry An introduction to connected Manufacturing, An architecture fro the connected factory, industrial automation control protocols, connected factory security
IoT and M2M Introduction,M2M,Difference between IoT and M2M,SDN and NFV for IoT
Textbook:1 Ch.9
Textbook 2:Ch.3 **08 Hours**

Module - 5

Home Automation smart Lighting, Smart Appliances ,Intrusion Detection, Smoke/Gas detectors,
Cities**:** Smart Parking, Smart Lighting, Smart Roads, Structure Health Monitoring, Surveillance, Emergency response Environment Weather Monitoring Air Pollution Monitoring Noise Pollution Monitoring Forest Fire Detection River Floods detection, Energy Smart grids, Renewable Energy systems ,Prognostics Retail Inventory Management ,Smart Payments, Smart Vending Machines Logistics, Route Generation and Scheduling Fleet Tracking Shipment Monitoring, remote Vehicle Diagnostics Agriculture Smart Irrigation Green House Control Industry machine Diagnosis and Prognosis Indoor air Quality Monitoring Health and Life style Health and Fitness Monitoring Wearable Electronics
Textbook 2:Ch .2 **08 Hours**

Course Outcomes: At the end of the course, students will be able to:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Model the Internet of things to business
- Understand the practical knowledge through different case studies

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equalmarks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	Pearson Education (Cisco Press Indian Reprint)	1 st Edition, ISBN: 978-9386873743
2	Internet of Things (A Hands-on Approach)	Vijay Madisetti and ArshdeepBahga	Universities Press	1st Edition
Reference Books				
1	Internet of Things	Srinivasa K G	CENGAGE Leaning India,	2017
2	Internet of Things: Architecture and Design Principles	Raj Kamal	McGraw Hill Education,	1st Edition, ISBN: 978-9352605224

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER –7th

WEB AND MOBILE APPLICATIONDEVELOPMENT

Course Code	**18CB733**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	3	Exam Hours	03

Course Objectives: This course will enable students

- To know Structure and implement HTML/CSS.
- Apply intermediate and advanced web development practices.
- Implement basic JavaScript.
- To facilitate students to understand android SDK
- To help students to gain a basic understanding of Android application development
- To inculcate working knowledge of Android Studio development tool

Module - 1

INTRODUCTION TO HTML: Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling. HTML Tables and Forms.

Textbook: T1

08Hours

Module - 2

JAVASCRIPT: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions**.**

Textbook: T1

08Hours

Module - 3

MANAGING STATE: Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript PseudoClasses, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services.

Textbook: T1

08Hours

Module - 4

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

Textbook:T2 and Reference books

08Hours

Module - 5

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents**.** Testing Android applications, Publishing Android application, Using Android preferences, Managing

Application resources in a hierarchy, working with different types of resources.
Textbook:T2 and Reference books

08Hours

Course Outcomes: At the end of the course, students will be able to:

- Adapt HTML and CSS syntax and semantics to build web pages.
- Construct and visually format tables and forms using HTML and CSS
- Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
- Create, test and debug Android application by setting up Android development environment.
- Implement adaptive, responsive user interfaces that work across a wide range of devices.
- Analyze performance of android applications and understand the role of permissions and security

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equalmarks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	Fundamentals of Web Development.	Randy Connolly, Ricardo Hoar	Pearson Education India	1st Edition
2	Android Wireless Application Development	Lauren Darcey and Shane Conder	Pearson Education	2nd Edition
Reference Books				
1	Professional Android 2 Application Development	Reto Meier	Wiley India Pvt Ltd	1st Edition
2	Beginning Android	Mark L Murphy	Wiley India Pvt Ltd	1st Edition

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER –7th

DOT NET FRAMEWORK FOR APPLICATION DEVELOPMENT

Course Code	**18CB734**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	3	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Inspect Visual Studio programming environment and toolset designed to build applications for Microsoft Windows
- Understand Object Oriented Programming concepts in C# programming language.
- Interpret Interfaces and define custom interfaces for application.
- Build custom collections and generics in C#
- Construct events and query data using query expressions

Module-1

Introducing Microsoft Visual C# and Microsoft Visual Studio 2015: Welcome to C#, Working with variables, operators and expressions, Writing methods and applying scope, Using decision statements, Using compound assignment and iteration statements, Managing errors and exceptions
T1: Chapter 1 – Chapter 6 RBT: L1, L2

08 Hours

Module-2

Understanding the C# object model: Creating and Managing classes and objects, Understanding values and references, Creating value types with enumerations and structures, Using arrays
Textbook 1: Ch 7 to 10 RBT: L1, L2

08 Hours

Module-3

Understanding parameter arrays, Working with inheritance, Creating interfaces and defining abstract classes, Using garbage collection and resource management
Textbook 1: Ch 11 to 14 RBT: L1, L2

08 Hours

Module-4

Defining Extensible Types with C#: Implementing properties to access fields, Using indexers, Introducing generics, Using collections
Textbook 1: Ch 15 to 18 RBT: L1, L2

08 Hours

Module-5

Enumerating Collections, Decoupling application logic and handling events, Querying inmemory data by using query expressions, Operator overloading
Textbook 1: Ch 19 to 22 RBT: L1, L2

08 Hours

Course outcomes:

At the end of the course the student will be able to:

- Build applications on Visual Studio .NET platform by understanding the syntax and semantics of C#
- Demonstrate Object Oriented Programming concepts in C# programming language
- Design custom interfaces for applications and leverage the available built-in interfaces in building complex applications.
- Illustrate the use of generics and collections in C#
- Compose queries to query in-memory data and define own operator behaviour

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	Microsoft Visual C# Step by Step	John Sharp	PHI Learning Pvt. Ltd	8th Edition, 2016
Reference Books				
1	C# 6 and .NET Core 1.0	Christian Nagel	Wiley India Pvt Ltd	1st Edition, 2016
2	Head First C#	Andrew Stellman and Jennifer Greene	O"Reilly Publications	2013
3	Essential C# 6.0	Mark Michaelis	Pearson Education India	5th Edition, 2016
4	Prof C# 5.0 and the .NET 4.5 Framework	Andrew Troelsen	Apress and Dreamtech Press	6th Edition, 2012

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
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SEMESTER –7th

ENTERPRISE SYSTEMS

Course Code	**18CB735**	CIE Marks	40
Teaching Hours/Week (L:T:P: S)	3:0:0	SEE Marks	60
Credits	03	Total Marks	100
		Exam Hours	03

Course Objectives:

1. Understand the concept of Simple Web Applications using MVC.
2. Be exposed to different models in SOA and ERP.
3. Be exposed to CRM models.
4. Be exposed to interactive networks and applications. Be familiar with configuration of networking

Module-1

WEB APPLICATIONS USING MVC

Overview of Database Management Systems; Overview of Model - View - Control (MVC); Control (MVC) method of software development in a 3 tier environment - Tools and Technologies; Brief overview of the following : Java server pages; Related Java Technologies; Microsoft .NET framework; PHP; Ruby on Rails; JavaScript; Ajax; Angular/React JS.

08 Hours

Module-2

SOA AND ERP MODELS

Service Oriented Architecture (SOA); Principles of loose coupling, encapsulation; Inter-operatibility; Web Services as the implementation vehicle protocols, usage; Enterprise Resource Planning (ERP); systems and their architecture; Overview of SAP and Oracle Applications; Generic ERP Modules : Finance; HR; Materials Management; Investment, etc. ; Examples of Domain Specific Modules.

08 Hours

Module-3

CRM MODELS

Electronic Data Exchange; Customer Relationship Management (CRM); Customer Relationship Management (CRM); Supplier Relationship Management (SRM) ; Security Issues - Authentication, Authorisation, Access control ; Roles; single-sign-on ; Directory servers, Audit trails; Digital signatures; Encryption: review of IPSec, SSL and other technologies; Simple Applications Demo; Case study

08 Hours

Module-4

INTERACTIVE NETWORK AND APPLICATION

Overview of : MPLS ; Virtual Private Networks (VPN) ; Firewalls ; Network monitoring and enforcement of policies ; Software Acquisition Process ; Tendering; conditions of contract ; Commercial off the shelf software (COTS) versus Bespoke Implementations; Total cost of ownership; Issues on using Open source software or free software; Licensed software; Case study

08 Hours

Module-5

CONFIGURATION OF NETWORKING

Hardware Architectures for Enterprise Systems; Servers; Clustering; Storage area networks; Storage units; Back-up strategies; Local Area Network (LAN) technologies and products; Data Centres; Disaster recovery site design and implementation issues; Hardware Acquisition Issues; Case study

08 Hours

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO 1. Design and deploy Simple Web Applications using MVC.
CO 2. Design SOA and ERP models.
CO 3. Design of CRM models.
CO 4. Design interactive network and application.
CO 4. Manage, Maintain and configuration of Networking.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks

1 Alexis Leon, "Enterprise Resource Planning", Tata McGraw Hill, 3rd Edition, 2017.
2 Alexis Leon, "Enterprise Resource Planning – Diversified",TMH, 2 nd Edition.

Reference Books

1 Ravi Shankar & S. Jaiswal, Galgotia, "Enterprise Resource Planning", 1 st Edition, 1999.
2 Dr. Ravi Kalakota, "E-Business Network Resource planning using SAP R/3 Baan and Peoples soft: A Practical Roadmap For Success", Pearson, 2nd Edition, 2001.

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
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SEMESTER – 7th

USABILITY DESIGN OF SOFTWARE

Course Code	**18CB741**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- To know the knowledge of user- centered design, user -centered methods in design.
- To make graphic design on screens, simulation and prototyping techniques,
- To provide usability testing methods, interface technologies and user centered design in corporate perspective.

Module - 1

THE USER INTERFACE: The User Interface-Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design. **08Hours**

Module - 2

THE USER INTERFACE DESIGN PROCESS: The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards. **08Hours**

Module - 3

SYSTEM MENUS AND NAVIGATION SCHEMES: System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus. **08Hours**

Module - 4

Windows: Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls. **08Hours**

Module - 5

SCREEN BASED CONTROLS - Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests. **08Hours**

Course Outcomes: At the end of the course, students will be able to:

- Design the User Interface, design, menu creation, windows creation and connection between menus and windows.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.

• Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module.				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Edition and year**
Textbooks				
1	The Essential Guide to User Interface Design	Wilbert O. Galitz	John Wiley & Sons	2nd Edition 2002
Reference Books				
1	Design the User Interface	Ben Sheiderman	Pearson Education	1998
2	The Essential of User Interface Design	Alan Cooper	Wiley- Dream Tech Ltd	2002

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

CRYPTOGRAPHY AND NETWORK SECURITY

Course Code	**18CB742**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	3	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Explain standard algorithms used to provide confidentiality, integrity and authenticity.
- Distinguish key distribution and management schemes.
- Deploy encryption techniques to secure data in transit across data networks
- Implement security applications in the field of Information technology

Module-1

Classical Encryption Techniques Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Mono-alphabetic Cipher, Playfair Cipher, Hill Cipher, Poly alphabetic Cipher, One Time Pad.

Block Ciphers and the data encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm **08 Hours**

Module-2

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public- key cryptosystems. Applications for public-key cryptosystems, requirements for public- key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm computational aspects, the security of RSA. **Other Public-Key Cryptosystems:** Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves overGF(2m), Elliptic curve cryptography Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher PRNG based on RSA. **08 Hours**

Module-3

Key Management and Distribution: Symmetric key distribution using Symmetric encryption A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure. **User Authentication:** Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation personal identity verification.

08 Hours

Module-4

Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function. **Web Security Considerations:** Web Security Threats, Web Traffic Security Approaches. **Secure Sockets Layer: SSL** Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. **Transport Layer Security:** Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. **HTTPS** Connection Initiation, Connection Closure. **SecureShell(SSH)** Transport Layer Protocol, User Authentication Protocol, Connection Protocol **08 Hours**

Module-5

Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages S/MIME certificate processing, enhanced security services, Domain keys identified mail internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. **IP Security:** IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms Padding, Anti replay service, transport and tunnel modes, combining security associations authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits.

08 Hours

Course outcomes:

At the end of the course the student will be able to:

- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	Cryptography and Network Security	William Stallings	Pearson	6th Edition
Reference Books				
1	Cryptography and Information Security	V K Pachghare		

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

DATA MINING AND DATA WAREHOUSING

Course Code	**18CB743**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

COURSE OBJECTIVES:

1. To teach the basic principles, concepts and applications of data warehousing and data mining
2. To introduce the task of data mining as an important phase of knowledge recovery process
3. To familiarize Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
4. To impart knowledge of the fundamental concepts that provide the foundation of data mining

Module - 1

INTRODUCTION TO DATA MINING: Motivation, Importance, Definition of Data Mining, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System With A Database or Data Warehouse System, Major Issues In Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity. PREPROCESSING: Data Quality, Major Tasks in Data Preprocessing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration. **08Hours**

Module - 2

DATA WAREHOUSING AND ON-LINE ANALYTICAL PROCESSING: Data Warehouse basicconcepts, Data Warehouse Modeling - Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction. DATA CUBE TECHNOLOGY: Efficient Methods for Data Cube Computation, Exploration and Discovery in Multidimensional Databases. **08Hours**

Module - 3

MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Are All the Pattern Interesting, Pattern Evaluation Methods, Applications of frequent pattern and associations. FREQUENT PATTERN AND ASSOCIATION MINING: A Road Map, Mining Various Kinds of Association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns. **08Hours**

Module - 4

CLASSIFICATION: Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification, Bayesian Belief Networks, Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors), Other Classification Methods. **08Hours**

Module - 5

CLUSTER ANALYSIS: Basic Concepts of Cluster Analysis, Clustering structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model Based Clustering - The Expectation-Maximization Method, Other Clustering Techniques, Clustering High-Dimensional Data, Constraint-Based and User-Guided Cluster Analysis. OUTLIER ANALYSIS: Why outlier analysis, Identifying and handling of outliers, Distribution Based Outlier Detection: A Statistics-Based Approach, Classification-Based Outlier Detection, Clustering-Based Outlier Detection, Deviation-Based Outlier Detection, Isolation-Based Method: From Isolation Tree to Isolation Forest. **08Hours**

Course Outcomes:

After undergoing the course, Students will be able to understand

- Design a data mart or data warehouse for any organization
- Develop skills to write queries using DMQL
- Extract knowledge using data mining techniques
- Adapt to new data mining tools.
- Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Data Mining: Concepts and Techniques	Jiawei Han, MichelineKamber, Jian Pei	Elsevier, United States of America	3 rd edition
Reference Books				
1	Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions	Thomas J. Mowbray	John Wiley & Sons	2006
2	Data Warehousing, Thomson Learning	Amitesh Sinha	Thomson Learning, India	2007
3	Top Ten Algorithms in Data Mining	Xingdong Wu, Vipin Kumar	CRC Press	2009

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

BEHAVIORAL ECONOMICS

Course Code	**18CB744**	CIE Marks	40
Teaching Hours/Week (L:T:P: S)	3:0:0	SEE Marks	60
Credits	03	Total Marks	100
		Exam Hours	03

Course Learning Objectives:

- To understand the concept and theory of economics.
- To acquire knowledge on the choices and behavior of firms, households and other economics entities.
- To learn the behavioral science perspective in economics.
- To know the current ideas and concepts regarding decision making in economics.
- To study the intertemporal choice in economics.

Module-1

INTRODUCTION

The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; applications – gains and losses, money illusion, charitable donation.

8Hours

Module-2

BASICS OF CHOICE THEORY

Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies.

8Hours

Module-3

BELIEFS, HEURISTICS AND BIASES

Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and selfprojection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia, policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design.

8Hours

Module-4

CHOICE UNDER UNCERTAINTY

Background and expected utility theory; prospect theory and other theories; reference points; loss aversion; marginal utility; decision and probability weighting; applications – ownership and trade, income and consumption, performance in sports. Strategic choice-Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signalling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry.

8Hours

Module-5

INTERTEMPORAL CHOICE

Geometric discounting; preferences over time; anomalies of inter-temporal decisions; hyperbolic discounting; instantaneous utility; alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings, clubs and membership, consumption planning. Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion.

8Hours

Course Outcomes

At the end of the course the student will be able to:

CO 1. Understand and apply various concepts in traditional and modern Microeconomics.

CO 2. Focus on decision making, and develop a holistic understanding of these concepts and their interconnections.

CO 3. Explore the knowledge on behavioural science perspective in Economics.

CO 4. Understand current ideas and concepts regarding decision making in Economics.

CO 5. Students will be able to understand the intertemporal choice in Economics.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks

1 N. Wilkinson and M. Klaes , "An Introduction to Behavioral Economics", 2017.

2 Paul A. Samuelson, William D. Nordhaus, Sudip Chaudhuri and AnindyaSen, "Economics", 19th edition, Tata McGraw Hill, 2010.

3 M.L.Trivedi, "Managerial Economics:Theory & Applications", Tata McGraw-Hill Education, 4 th Edition, 2002.

4 Robert H. Frank, 2014, "Microeconomics and Behaviour", McGraw-Hill, 9 th Edition, 2014.

5 Philip Corr, Anke Plagnol, "Behavioral Economics: The Basic", Routledge; 1st edition, 2018.

Reference books:

1 William Boyes and Michael Melvin, "Textbook of Economics", DTECH, 6th Edition, 2004.

2 N. Gregory Mankiw, "Principles of Economics", Thomson learning, 3rd Edition, 2003.

3 Richard Lipsey and Alec Charystal, "Economics", Oxford, University Press, 12th Edition, 2011.

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

WEB AND CYBER SECURITY

Course Code	**18CB745**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
- To develop graduates that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets

Module - 1

TRANSPORT LAYER SECURITY: Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. HTTPS Connection Initiation, Connection Closure. Secure Shell(SSH) Transport Layer Protocol, User Authentication Protocol, Connection Protocol.

TextBook:T1 **08Hours**

Module - 2

IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations.

TextBook:T1 **08Hours**

Module - 3

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

TextBook:T2 **08Hours**

Module - 4

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

ReferenceBook **08Hours**

Module - 5

Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation

TextBook:T2 **08Hours**

Course Outcomes: At the end of the course, students will be able to:

- Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
- Design, develop, test and evaluate secure software.
- Demonstrate cyber security cybercrime and forensics.
- Infer legal issues in cybercrime

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Cryptography and Network Security	William Stallings	Pearson	6 th edition
2	Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives	SunitBelapure and Nina Godbole	Wiley India Pvt Ltd	2013
Reference Books				
1	Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions	Thomas J. Mowbray	John Wiley & Sons,	

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

USER INTERFACE DESIGN

Course Code	**18CB751**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	3	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- To study the concept of menus, windows, interfaces
- To study about business functions
- To study the characteristics and components of windows andthe various controls for the windows.
- To study about various problems in windows design with color, text, graphics and To study the testing methods

Module-1

The User Interface-Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design

Textbook 1: Ch. 1,2
RBT: L1, L2

08 Hours

Module-2

The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards.

Textbook 1: Part-2 RBT: L1, L2

08 Hours

Module-3

System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus.

Textbook 1: Part-2
RBT: L1, L2

08 Hours

Module-4

Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls.

Textbook 1: Part-2 RBT: L1, L2

10 Hours

Module-5

Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests.

Textbook 1: Part-2
RBT: L1, L2

08 Hours

Course outcomes:

At the end of the course the student will be able to:

- Design the User Interface, design, menu creation, windows creation and connection between menus and windows.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	The Essential Guide to User Interface Design	Wilbert O. Galitz	John Wiley & Sons	Second Edition 2002
Reference Books				
1	Design the User Interface	Ben Sheiderman	Pearson Education	1998
2	The Essential of User Interface Design	Alan Cooper	Wiley- Dream Tech Ltd	2002

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

INTRODUCTION TO CLOUD COMPUTING

Course Code	**18CB752**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	3	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Understand cloud computing bascis, infrastructure, services.
- Understand the cloud computing technology.
- Understand the Saas.

Module-1

Cloud Computing Basics: Cloud Computing Overview, Applications, Intranets and the cloud, First Movers in the cloud. Your Organization and Cloud Computing: When you can use Cloud Computing, Benfits, Limitations, Security Concerns. Cloud Computing with the titans: Google, EMC, NetApp, Microsoft, Amazon, IBM. The Business Case for going to the cloud: Cloud Computing services, how those applications help your business, Deleting your data center.

08 Hours

Module-2

Hardware and Infrastructure: Clients, Security, Network, Services. Accessing the cloud: Platforms, Web Applications, Web APIs, Web Browsers. Cloud Storage: Overview, Cloud Storage Providers

08 Hours

Module-3

Software as a service: Overview, Driving Forces, Company Offerings, Induistries. Software plus services: Overview, Mobile Device Integration, Providers, Microsoft Online.

08 Hours

Module-4

Developing Applications: Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management. Local Clouds and Thin Clients: Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study.

08 Hours

Module-5

Migrating to the Cloud: Cloud Services for industries, Cloud Services aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration. Best Practices and the future of cloud computing: Analyze your service, Best Practices, How cloud computing Might Evolve.

08 Hours

Course outcomes:

At the end of the course the student will be able to:

- Describe Cloud Models, Cloud Infrastructure
- Discuss the key dimensions and challenges of Cloud Computing and Architecture and Workflow.
- Discuss about the Cloud Computing Technology and Software as a service

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl	Title of the book	Name of the	Publisher	Edition and

No		Author/s	Name	year
Textbook/ Textbooks				
1	Cloud Computing : A Practical Approach	Antony T Velte	McGrawHill	
2	Cloud Computing Theory and Practice	Dan C Marinescu	Elsevier(MK)	2013
Reference Books				
1	Computer Networks: A Systems Approach	Larry L. Peterson and Bruce S Davie	Elsevier	5th Edition, 2011
2	Computer Networks	Tanenbaum	Pearson Education/PHI	4th Edition, 2003
3	Data and Computer Communications	William Stallings	Pearson Education	8th Edition, 2012

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 7th

PYTHON PROGRAMMING

Course Code	**18CB753**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	3	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Learn Syntax and Semantics and create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Implement Object Oriented Programming concepts in Python
- Build Web Services and introduction to Network and Database Programming in Python.

Module-1

Why should you learn to write programs, Variables, expressions and statements, Conditional execution, Functions

Textbook 1: Chapters 1 – 4
RBT: L1, L2, L3

08 Hours

Module-2

Iteration, Strings, Files

Textbook 1: Chapters 5– 7 RBT: L1, L2, L3

08 Hours

Module-3

Lists, Dictionaries, Tuples, Regular Expressions

Textbook 1: Chapters 8 - 11 RBT: L1, L2, L3

08 Hours

Module-4

Classes and objects, Classes and functions, Classes and methods

Textbook 2: Chapters 15 – 17 RBT: L1, L2, L3

08 Hours

Module-5

Networked programs, Using Web Services, Using databases and SQL

Textbook 1: Chapters 12– 13, 15 RBT: L1, L2, L3

08 Hours

Course outcomes:

At the end of the course the student will be able to:

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	Python for Everybody: Exploring Data Using Python 3	Charles R. Severance	CreateSpace Independent Publishing Platform	1st Edition, 2016 (http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf)
2	Think Python: How to Think Like a Computer Scientist	Allen B. Downey	Green Tea Press	2nd Edition, 2015 (http://greenteapress.com/thinkpython2/thinkpython2.pdf (Download pdf files from the above links)
Reference Books				
1	Introduction to Computer Science Using Python	Charles Dierbach	Wiley India Pvt Ltd	ISBN-13: 978-8126556014 , 1st Edition, 2015
2	Introduction to Python Programming	Gowrishankar S, Veena A	CRC Press/Taylor & Francis,	ISBN-13: 978-0815394372 , 1st Edition, 2018
3	Programming Python	Mark Lutz	O"Reilly Media	ISBN-13: 978-9350232873, 4th Edition, 2011
4	Data Structures and Algorithms in Python	Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich	Wiley India Pvt Ltd	ISBN-13: 978-8126562176, 1st Edition, 2016
5	Python Programming Using Problem Solving Approach	Reema Thareja	Oxford university press	ISBN-13: 978-0199480173, 2017

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – 7th

CLOUD COMPUTING LABORATORY

Course Code	**18CBL76**	CIE Marks	40
Teaching Hours/Week (L:T:P)	0:2:2	SEE Marks	60
Credits	2	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

Experiments List:

1.	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2.	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3.	Install Google App Engine. Create hello world app and other simple web applications using python/java.
4.	Use GAE launcher to launch the web applications.
5.	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6.	Find a procedure to transfer the files from one virtual machine to another virtual machine.
7.	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8.	Install Hadoop single node cluster and run simple applications like wordcount.

Laboratory Outcomes: The student should be able to:

- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large data sets in a parallel environment.

Conduct of Practical Examination:

- Experiment distribution

- For laboratories having only one part: Students are allowed to pick one experiment fromthe lot with equal opportunity.
- For laboratories: Students are allowed to pick one experiment
- Change of experiment is allowed only once and marks allotted for procedure to be made zero ofthe changed part only.
- Marks Distribution *(Courseed to change in accoradance with university regulations)*
  i) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 8th

BIG DATA AND ANALYTICS

Course Code	**18CB81**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	3	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Understand fundamentals of Big Data analytics
- Explore the Hadoop framework and Hadoop Distributed File system
- Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
- Employ MapReduce programming model to process the big data
- Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.

Module-1

Introduction to Big Data Analytics: Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies.

Text book 1: Chapter 1: 1.2 -1.7

RBT: L1, L2, L3 **08 Hours**

Module-2

Introduction to Hadoop (T1): Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools. Hadoop Distributed File System Basics (T2): HDFS Design Features, Components, HDFS User Commands. Essential Hadoop Tools (T2): Using Apache Pig, Hive, Sqoop, Flume, Oozie, HBase.

Text book 1: Chapter 2 :2.1-2.6
Text Book 2: Chapter 3
Text Book 2: Chapter 7 (except walk throughs)
RBT: L1, L2, L3

08 Hours

Module-3

NoSQL Big Data Management, MongoDB and Cassandra: Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases.

Text book 1: Chapter 3: 3.1-3.7
RBT: L1, L2, L3

08 Hours

Module-4

MapReduce, Hive and Pig: Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig.

Text book 1: Chapter 4: 4.1-4.6
RBT: L1, L2, L3

08 Hours

Module-5

Machine Learning Algorithms for Big Data Analytics: Introduction, Estimating the relationships, Outliers, Variances, Probability Distributions, and Correlations, Regression analysis, Finding Similar Items, Similarity of Sets and Collaborative Filtering, Frequent Itemsets and Association Rule Mining. Text, Web Content, Link, and Social Network Analytics: Introduction, Text mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and analyzing a Web Graph, Social Network as Graphs and Social Network Analytics:

Text book 1: Chapter 6: 6.1 to 6.5
Text book 1: Chapter 9: 9.1 to 9.5

08 Hours

Course outcomes:

At the end of the course the student will be able to:

- Understand fundamentals of Big Data analytics.
- Investigate Hadoop framework and Hadoop Distributed File system.
- Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
- Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
- Use Machine Learning algorithms for real world big data.
- Analyze web contents and Social Networks to provide analytics with relevant visualization tools

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning	Raj Kamal and Preeti Saxena	McGraw Hill Education	ISBN: 9789353164966, 9353164966, 2018
2	Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem	Douglas Eadline	Pearson Education	ISBN13: 978-9332570351, 2016
Reference Books				
1	Hadoop: The Definitive Guide	Tom White	O‟Reilly Media	ISBN-13: 978-9352130672, 4th Edition, 2015
2	Professional Hadoop Solutions	Boris Lublinsky, Kevin T Smith, Alexey Yakubovich	Wrox Press	ISBN-13: 978-8126551071, 1st Edition, 2014
3	Hadoop Operations: A Guide for Developers and Administrators	Eric Sammer	O'Reilly Media	ISBN-13: 978-9350239261, 1st Edition, 2012
4	Big Data Analytics: A Hands-On Approach	Arshdeep Bahga, Vijay Madisetti	VPT Publications	ISBN-13: 978-0996025577, 1st Edition, 2018

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 8th

FINANCIAL MANAGEMENT

Course Code	**18CB821**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- To familiarize the students with basic concepts of financial management
- To understand concept of time value of money and its uses.
- To evaluate the investment proposals.
- To analyze capital structure and dividend decision.

Module - 1

Financial Management – Introduction to financial management, objectives , Functions and Goals of financial management. Finance – Profit Maximisation, Wealth Maximisation, Financial Decisions.
Sources of Financing - Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture Capital, Angel investing and private equity,(Theory only)

08 Hours

Module - 2

Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity. Simple interest & Compound interest. (Theory & Problem).
Working capital management – factors influencing working capital requirements - Current asset policy and current asset finance policyDetermination of operating cycle and cash cycle - Estimation of working capital requirements of a firm. (Theory & Problem).

08 Hours

Module - 3

Capital Structure : Meaning of Capital structure – optimum Capital Structure ; Factors determining capital structure – Leverages – Operating leverage, Financial Leverage and Combined Leverage –
EPS analysis – (Theory & Problem).

08 Hours

Module - 4

Investment decisions – Meaning and significance of Capital Budgeting. Investment evaluation criteria- Pay-back period, Net Present Value, Accounting Rate of Return. Internal Rate of Return- (Theory & Problem).

08 Hours

Module - 5

Dividend Decisions :
Meaning - Dividend policy **,**Types of Dividend policies -– Factors affecting the dividend policy - Dividend decisions. (Theory only)

08 Hours

Course Outcomes: At the end of the course, students will be able to:

- Understand the basic financial concepts.
- Apply time value of money.
- Evaluate the investment decisions.
- Analyze the capital structure and dividend decisions.
- 5. Estimate working capital requirements.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

• The students will have to answer 5 full questions, selecting one full question from each module.				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Edition and year**
Textbooks				
1	Financial Management	M Y Khan ,P K Jain	Tata Mc Graw – Hill Publishing Company Limited	4th Edition
2	Financial Management	Prasanna Chandra	Tata Mc Graw – Hill Publishing Company Limited	9th Edition
Reference Books				
1	Essentials of Financial Management	I.M. Pandey	Vikas Publishing House Pvt Limited	…..
2	Financial Management	S.C. Kucchal	Vikas Publishing House Pvt Limited	…..

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 8th

SOFTWARE DESIGN AND DESIGN THINKING

Course Code	**18CB822**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- To know the correctness of software design as per the requirement.
- To learn the design components like data structures, modules, and external interfaces.
- To explain the concept of design thinking for product and service development.
- To explain the fundamental concept of innovation and design thinking.
- To discuss the methods of implementing design thinking in the real world.

Module - 1

Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy. Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Template Method

Textbook 1 and RBT **08Hours**

Module - 2

Interactive systems and the MVC architecture:

Introduction, The MVC architectural pattern, analyzing a simple drawing program, designing the system, designing of the subsystems, getting into implementation, implementing undo operation, drawing incomplete items, adding a new feature, pattern-based solutions.

Textbook 1 and RBT **08Hours**

Module - 3

Designing with Distributed Objects:

Client server system, java remote method invocation, implementing an object-oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.

Textbook 2 and RBT **08Hours**

Module - 4

PROCESS OF DESIGN: Understanding Design thinking: Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping

Textbook 3 **08Hours**

Module - 5

Tools for Design Thinking Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design**.**

Textbook 3 **08Hours**

Course Outcomes: At the end of the course, students will be able to:

- Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary.
- Be able to select and apply suitable patterns in specific contexts
- Appreciate various design process procedure
- Generate and develop design ideas through different technique
- Identify the significance of reverse Engineering to Understand products

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Design Patterns	Erich Gamma, Richard Helan, Ralph Johman, John Vlissides	Pearson Publication	2013
2	Object-oriented analysis, design and implementation	Brahma Dathan, Sarnath Rammath	Universities Press	2013
3	Design Thinking: Understand – Improve – Apply	Plattner	Springer	2011
Reference Books				
1	Pattern Oriented Software Architecture	Frank Bachmann, ReginеMeunier, Hans Rohnert	Universities Press	Volume 1, 1996
2	Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis	William J Brown et al	John Wiley	1998

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 8th

OPERATIONS MANAGEMENT

Course Code	**18CB823**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- Formulate optimization problem as a linear programming problem.
- Solve optimization problems using simplex method.
- Formulate and solve transportation and assignment problems.
- Apply game theory for decision making problems.

Module - 1

Introduction to OR -Definition**,** scope of Operations Research, characteristics, advantages and limitations. Quantitative approach to decision making models
Introduction, Linear Programming(LPP) Mathematical formulation of problem –LPP by Graphical Methods, problems on Maximization and Minimization **8 Hours**

Module - 2

Assignment problems - Introduction, General structure. Formulation, Solutions to assignment problems by Hungarian method, Special cases in assignment problems, unbalanced, Maximization assignment problems. Travelling Salesman Problem (TSP). Difference between assignment and T.S.P

8 Hours

Module – 3

Simulation: simulation concepts, simulation of a queuing system using event list, pseudo random numbers, multiplication congenital algorithm, basic ideas of Monte-Carlo simulation
Game Theory -Formulation of game models, Two person Zero sum games & their solution, 2 x N and M x 2 games, pure strategy games with saddle point, Limitations of game theory.

8 Hours

Module – 4

Transportation Problems: The transportation problem, Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Least Cost Method, Vogel's Approximation Method. Optimal solution by Modified Distribution Method (MODI).

8 Hours

Module - 5

Project Management: Structure of projects, phases of project management-planning, scheduling, controlling phase, work breakdown structure, project control charts, network planning, PERT & CPM, Network components & precedence relationships, critical path analysis, probability in PERT analysis, Theory of crashing.

8 Hours

Course Outcomes: At the end of the course, students will be able to:

- Select and apply optimization techniques for various problems.
- Model the given problem as transportation and assignment problem and solve.
- Apply game theory for decision support system.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.

• Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Edition and year**
Textbooks				
1	Operations Research	D.S. Hira and P.K. Gupta	y S. Chand & Company Ltd, 2014	2014
	Operations Research An Introduction,	Taha A Hamdy	PHI Private Limited	Seventh Edition
Reference Books				
1	Operations Research Theory & Applications	J K Sharma	Macmillan India Ltd	2007
2	Operation Research	P. K. Gupta and D. S. Hira	S. Chand & co.	2007

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 5th

COMPUTATIONAL FINANCE & MODELING

Course Code	**18CB824**	CIE Marks	40
Teaching Hours / Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives: This course will enable students

- To make the students to understand how the techniques in computational finance applied in risk hedging and pricing of options.

Module - 1

NUMERICAL METHODS AND MODELS:

Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance- examples of exact solutions including Black Scholes and its relatives. Finite difference methods including algorithms and question of stability and convergence. Treatment of near and far boundary conditions-the connection with binomial models- interest rate model- early exercise- the corresponding free boundary problems. Introduction to numerical methods for solving multi-factor models.

08 Hours

Module - 2

BLACK-SCHOLES FRAMEWORK:

Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. Option Greeks and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local volatility surfaces. Simulation including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the "Greeks."

08 Hours

Module - 3

FINANCIAL PRODUCTS AND MARKETS:

Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging.

08 Hours

Module - 4

APPLICATION AREAS:

The pricing of American options- pricing interest rate dependent claims, and credit risk. The use of importance of sampling for Monte Carlo simulation of VaR for portfolios of options.

08 Hours

Module - 5

STATISTICAL ANALYSIS OF FINANCIAL RETURNS:

Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data. Copulas, Hedging in incomplete markets, American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.

08 Hours

Course Outcomes: At the end of the course, students will be able to:

- Understand existing financial models in a quantitative and mathematical way.
- Apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering.
- Explain the approaches required to calculate the price of options.
- Identify the methods required to analyse information from financial data and trading systems.
- Understand the various statistical methods to analyse the financial data.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbooks				
1	Tools for Computational Finance	R. Seydel	Springer-Verlag, New York	2nd edition, 2004
2	Monte Carlo Methods in Financial Engineering	P. Glasserman	Springer-Verlag, New York	2004
3	"Numerical Recipes in C: The Art of Scientific Computing	W. Press, S. Teukolsky, W. Vetterling and B. Flannery	Cambridge University Press, Cambridge, UK	1997 Available on-line at: http://www.nr.com/
4	Option Valuation under Stochastic Volatility	A. Lewis	Finance Press, Newport Beach, California	2000
5	Efficient Methods for Valuing Interest Rate Derivatives	A. Pelsse	Springer-Verlag, New York	2000

B.TECH IN COMPUTER SCIENCE AND BUSINESS SYSTEMS (CSBS)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – 8th

HIGH PERFORMANCE COMPUTING

Course Code	**18CB825**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	3	Exam Hours	03

Course Learning Objectives : This course will enable students to:

- Introduce students the design, analysis, and implementation, of high performance computational science and engineering applications.
- Illustrate on advanced computer architectures, parallel algorithms, parallel languages, and performance-oriented computing.

Module-1

Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing, Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques.

T1: Ch: 1.1, 1.2, 2.1 – 2.7
RBT: L1, L2

08 Hours

Module-2

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models Basic Communication perations: One-to-All Broadcast and All-to-One Reduction, Allto-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations

T1: Ch 3, 4
RBT: L1, L2

08 Hours

Module-3

Analytical Modeling of Parallel Programs: Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, The Effect of Granularity on Performance, Scalability of Parallel Systems. Minimum Execution Time and Minimum Cost-Optimal Execution Time, Asymptotic Analysis of Parallel Programs Section 5.7. Other Scalability Metrics, Programming Using the Message-Passing Paradigm: Principles of Message-Passing Programming, The Building Blocks Send and Receive Operations, MPI: the Message Passing Interface, Topologies and Embedding Overlapping Communication with Computation, Collective Communication and Computation Operations, Groups and Communicators

T1: Ch 5, 6
RBT: L1, L2, L3

08 Hours

Module-4

Programming Shared Address Space Platforms: Thread Basics, Why Threads?, The POSIX Thread API, Thread Basics: Creation and Termination, Synchronization Primitives in Pthreads, Controlling Thread and Synchronization Attributes, Thread Cancellation, 08 Composite Synchronization Constructs, Tips for Designing Asynchronous Programs, OpenMP: a Standard for Directive Based Parallel Programming Dense Matrix Algorithms: Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Solving a System of Linear Equations Sorting: Issues in Sorting on Parallel Computers, Sorting Networks, Bubble Sort and its Variants, Quicksort, Bucket and Sample Sort.

T1: Ch 7, 8 9
RBT: L1, L2

08 Hours

Module-5

Graph Algorithms: Definitions and Representation, Minimum Spanning Tree: Prim's Algorithm Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths, Transitive Closure Connected Components, Algorithms for Sparse Graphs, Search Algorithms for Discrete Optimization Problems: Definitions and Examples, Sequential Search Algorithms, Search Overhead Factor, Parallel Depth-First Search, Parallel Best-First Search, Speedup, Anomalies in Parallel Search Algorithms

T1: Ch10, 11
RBT: L1, L2 **08 Hours**

Course outcomes:

At the end of the course the student will be able to:

- Illustrate the key factors affecting performance of CSE applications
- Illusrate mapping of applications to high-performance computing systems
- Apply hardware/software co-design for achieving performance on real-world applications

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
Textbook/ Textbooks				
1	Introduction to Parallel Computing	AnanthGrama, Anshul Gupta, George Karypis, and Vipin Kumar	Addison-Welsey	2nd Edition, 2003
Reference Books				
1	An Introduction to Parallel Computing, Design and Analysis of Algorithms	Grama, A. Gupta, G. Karypis, V. Kumar	Addison-Welsey	2nd Edition, 2003
2	Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and their Implementation	G.E. Karniadakis, R.M. Kirby	Cambridge University Press	
3	Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers	Wilkinson and M. Allen	Prentice Hall	2nd Edition, 2005

4	Parallel Programming in C with MPI and OpenMP	M.J. Quinn	McGraw-Hill	2004
5	Highly Parallel Computing	G.S. Almasi and A. Gottlieb	Addison-Wesley	2nd Edition, 1994
6	Parallel Computer Architecture: A hardware/Software Approach	David Culler Jaswinder Pal Singh	Morgan Kaufmann	1999
7	Scalable Parallel Computing	Kai Hwang	McGraw Hill	1998