DEPARTMENT OF TECHNOLOGY,
SHIVAJI UNIVERSITY KOLHAPUR
THIRD YEAR B.TECH
Scheme of Teaching and Examination
Semester- V **(Computer Science and Technology)**

Subject Code	Subject	Teaching Scheme with Credits (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credits	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
CS311	System Programming	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS312	Computer Algorithm	3	1	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS313	Operating System-I	3	1	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS314	Software Engineering	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS315	Computer Graphics and Multimedia Techniques	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS311L	System Programming Lab	-	-	2	01	--------	--------	--------	EPE	50	20
CS312L	Computer Graphics and Multimedia Techniques Lab	-	-	2	01	--------	--------	--------	EPE	50	20
CS316L	Java Programming Lab	2	-	4	04	--------	--------	--------	IPE	50	20
									EPE	50	20
CS317	Seminar	-	-	2	01	---------	--------	--------	IOE	50	20
CS318	Internship-I	-	-	-	01	---------	--------	--------	IOE	50	20
	Total	**17**	**2**	**10**	**25**		**500**			**300**	

Audit Course III											
RM311	Research Methodology	**02**	-	-	-	Institute Level	-	-	-	-	-

Total contact hours per week: **29+2=31**

Note: Tutorials and Practical to be conducted in batches with batch strength not exceeding 15 students.

CIE: Continuous Internal Evaluation
IPE: Internal Practical Evaluation
IOE: Internal Oral Evaluation
SEE: Semester End Examination
EPE: External Practical Examination
EOE: External Oral Examination

Note:

1. Every individual student has to select a technical and field relevant topic for seminar and he or she has to deliver the same in the class. This particular activity is equivalent to one Credit and it carries 50 marks as an Internal Oral Evaluation (IOE) which is included in Semester V. The students, besides the seminar delivery, have to submit a brief report on the chosen seminar topic.

DEPARTMENT OF TECHNOLOGY,
SHIVAJI UNIVERSITY KOLHAPUR
THIRD YEAR B.TECH
Scheme of Teaching and Examination
Semester- VI **(Computer Science and Technology)**

Subject Code	Subject	Teaching Scheme with Credits (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credits	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
CS321	Compiler Construction	3	1	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS322	Operating System-II	3	1	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS323	Object Oriented Modeling and Design	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS324	Database Engineering	3	1	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS325	Engineering Economics	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CS323L	Object Oriented Modeling and Design Lab	-	-	2	01	--------	--------	--------	EOE	50	20
CS324L	Database Engineering Lab	-	-	2	01	--------	--------	--------	IPE	50	20
									EPE	50	20
CS326L	Advanced Programming Lab	2	-	2	03	--------	--------	--------	IPE	50	20
									EPE	50	20
CS327	Mini Project	-	-	2	01	--------	--------	--------	IOE	50	20
	Total	**18**	**03**	**08**	**25**		**500**			**300**	

Audit Course IV											
HS321	Introduction to Foreign Language	**02**	-	-	-	Institute Level	-	-	-	-	-

Total contact hours per week: **29+2=31**

Note: Tutorials and Practical to be conducted in batches with batch strength not exceeding 15 students

CIE: Continuous Internal Evaluation
IPE: Internal Practical Evaluation
IOE: Internal Oral Evaluation
SEE: Semester End Examination
EPE: External Practical Examination
EOE: External Oral Examination

Note: Internship II of minimum 4 weeks which is part of Semester VII evaluation will be the activity after the SEE of semester VI. It is mandatory for all the students to undergo the same and report to the institute for the semester VII along with the completion certificate by the concerned organization. The students have to submit a hard as well as soft copy of the activity report to the institute. Workload of the assessment is assigned to the respective Project guide.

Detailed Evaluation and Examination Scheme

1. Out of total 100 theory marks, 50 marks are assigned for Continuous Internal Evaluation (CIE). In CIE, obtaining minimum 20 marks is essential. It is similar to term work, the completion of which is mandatory to become eligible to appear for the Semester End Examination (SEE). Failing to complete the term in a particular course i.e. not obtaining 20 marks in CIE out of 50 shall be treated as term not granted in that course and it is on the part of the course teacher to officially inform the particular case through the respective Program Coordinator and the Director to the University Examination Section. The section will take a kind note of the same and it will not issue the hall ticket of the particular students for the SEE in the particular course/s.
2. CIE (50 marks) includes :
    - Internal Test - I, of 20 marks in 5^{th} week on 1^{st}& 2^{nd} unit
    - Internal Test - II, of 20 marks in 10^{th} week on 3^{rd}& 4^{th} unit
    - Activities for the students: 10 marks. It is at the course owners' discretion to get the assignments of varied nature completed by the students. However, the course teacher will plan to cover those course objectives that suit course learning outcomes and program outcomes that may not be covered in the internal tests.
3. For the Semester End Examination (SEE), 100 marks (3 hours) paper will be set and finally it will be converted to 50 marks. The students must secure minimum 40 % i.e. 20 marks in SEE as the University examination passing head.
4. Final theory marks (out of 100) will be the addition of CIE (out of 50 marks) and SEE (out of 50 marks).
5. Internal Practical/Oral Evaluation (IPE/IOE) will be on the basis of Internal Oral/ Practical/Tutorials/Seminar in which students must secure minimum 40% i.e. 20 marks. It is similar to the term work the completion of which is mandatory to be eligible to appear for the Semester End Examination (SEE).
6. External Practical/Oral Evaluation (EPE/EOE) will be conducted under the supervision by some external course expert. The minimum score 40% i.e. 20 marks is required to be secured as the University's passing head in EPE/EOE.

7. *Semester End Examination duration will be 4 hrs.
8. Equivalence for the Course: As elaborated at the end of this whole curriculum document.

Academic Autonomy:

1. Flexibility in deciding Structure and Contents of Curriculum with reasonable frequency for changes in the same.
2. Continuous Assessment of Students performance with newly adopted - Credit System based on award of grade.
3. Credits are simply a means of attaching relative values to courses of different components. These are a currency of learning and in general regarded as a measure of the time typically required to achieve a given curricular outcome.
4. All courses (Courses) under each Program/Discipline are unitized.

Credit system:

Education at the Institute is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow him/her to progress at an optimum pace suited to his/her ability or convenience. Each course by every student needs to fulfill minimum requirements of credits for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the Program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All Programs are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

Course credits assignment:

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Example: Course: Digital System and Microprocessor:5 credits (4-0-2)

The credits indicated for this course are computed as follows:

4 hours/week lectures = 4 credits

0 hours/week tutorial = 0 credit

2 hours/week practical = 2 *x* 0.5 = 1 credit

The contact hours in this case of **5**credits course is 6 hours per week. (**4**h Lectures + **0** h Tutorial + **2** h Practical=6 hours per week.)

For each lecture or tutorial credit, the self study component is 1 hour/week and 2 hours/week. In the above example, the student is expected to devote 3 + 1 = 4 hours per week on self study for this course, in addition to class contact of 5 hours per week.

Earning credits:

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance and allows the students to progress at an optimum pace suited to individual ability and convenience.

Features of Credit System at Shivaji University, Kolhapur:

Every course is allotted credits based on its academic importance/weightage.

1. All Courses may not have same credits.
2. There will be 23 to 28 Credits / Semester.
3. Absolute Grading System with 7 Passing Grades viz. AA, AB, BB, BC, CC, CD, DD and FF for failure.
4. Getting FF grade in 4 heads in one academic year, he/she is considered as failed.
5. Continuous Evaluation: Unit Test I i.e. T_1 [20 marks], and Unit Test II i.e. T_2 [20 marks]. Activities will be for 10 marks and the course owner/in charge will have discretion to decide the nature of activities.
6. Standardization of courses: Each course is unitized in 6 numbers. Unit Test I on units I and II while Unit Test II on units III & IV, SEE will be based on all the units of the course curriculum.
7. Unit Test I & Unit Test II will be supervised and evaluated by internal course teachers while SEE will be evaluated mostly by external and internal teachers as joint examiner ships.
8. Any request for re-test will not be entertained after internal test.
9. For both the semesters' failure courses, re-examination will be only after the even Semester End Examination. No re-examination will be conducted for odd semester courses in even semester or vice-versa.

Attendance rule:

All students must attend every lecture, tutorial and practical class. However, to account for late registration, sickness or other such conditions, the attendance requirement will be a minimum of 75 % of the classes actually held. A student with less than 75 % attendance in a course during the semester, in lectures, tutorials and practical taken together (as applicable), will be awarded the 'F' grade in that course irrespective of his/her performance in the tests.

Taking into account the consolidated attendance record for the whole semester, the course in charge in consultation with the Program Coordinator will award 'XX' grade to the student who is deficient in attendance. For the purpose of attendance calculation, every scheduled practical class will be counted as one unit irrespective of the number of contact hours.

Attendance record will be maintained based upon roll calls (or any equivalent operation) in every scheduled lecture, tutorial and practical class. The course owner will maintain and consolidate attendance record for the course (lectures, tutorials and practical together, as applicable).

Evaluation system:

1. Semester Grade Point Average (SGPA) =

$$\frac{\sum (\text{course credits in passed courses X earned grade points})}{\sum (\text{Course credits in registered courses})}$$

2. Cumulative Grade Point Average (CGPA) =

$$\frac{\sum (\text{course credits in passed courses X earned grade points) of all Semesters}}{\sum (\text{Course credits in registered courses) of all Semesters}}$$

3. At the end of B. Tech Program, student will be placed in any one of the divisions as detailed below:

   Ist Division with distinction: CGPA $\geq$8.25 and above

   IstDivision : CGPA $\geq$ 6.75 and <8.25

   IInd Division : CGPA $\geq$6.25 and < 6.75

As per AICTE Handbook (2011-12), gradation is as follows:

Grade Points	Equivalent Percentage Range
6.25	55
6.75	60
7.25	65
7.75	70
8.25	75

Conversion of CGPA to corresponding equivalent percentage marks for CGPA>5.0 may be obtained using the following equation:

Equivalent Percentage marks = (Respective CGPA x 10) – 7.5

An example of these calculations is given below:

Typical academic performance calculations - I semester

Course no.	**Course credits**	**Grade awarded**	**Earned credits**	**Grade points**	**Points Secured**
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6 (Col 4* Col 5)
MALXXX	5	CC	5	6	30
CSLXXX	4	CD	4	5	20
PHLXXX	4	AA	4	10	40
PHPXXX	2	BB	2	8	16
MELXXX	4	FF	0	0	0
TTNXXX	2	AB	2	9	18
Total	21		17	38	124

1. Semester Grade Point Average (SGPA) =

$$\frac{(124)}{(21)} = 5.90$$

2. Cumulative Grade Point Average (CGPA) =

Cumulative points earned in all passed courses = 124 (past semesters) + 124 (this sem.) = 248 Cumulative earned credits = 23 (past semesters) + 21 (this sem.) = 44

$$\frac{\sum (124 + 124)}{\sum (23 + 21)} = 5.63$$

Chart for marks range and its corresponding grade and grade points

Marks Range	Grade Points	Grade	Description of Performance
91-100	10	AA	Outstanding
86-90	09	AB	Excellent
76-85	08	BB	Very Good
66-75	07	BC	Good
56-65	06	CC	Fair
46-55	05	CD	Average
40-45	04	DD	Poor
Below 40	00	FF	Fail
--	--	$	Passed in first attempt
--	--	PP	Passed (Audit Course)
--	--	NP	Not Passed (Audit Course)
--	--	** 2^{nd} *** 3^{rd} **** 4^{th}	One grade punishment for 2^{nd} ,3^{rd}, 4^{th}, …attempt,

Audit Courses:

Additional courses shall be included as audit courses from the third semester onwards. While the performance of the student in audited courses shall be included in the Grade Card, these grades do not contribute to SGPA or CGPA of the concerned student.

Award of Degree:

Following rules prevail for the award of degree:

1. A Student has registered and passed all the prescribed courses under the general institutional and departmental requirements.
2. A student has obtained CGPA≥ 4.5.
3. A student has paid all the institute dues and satisfied all the requirements prescribed.
4. A student has no case of indiscipline pending against him/her.
5. Institute authorities shall recommend the award of B.Tech degree to a student who is declared to be eligible and qualified for above norms.

CGPA Improvement Policy for award of degree:

An opportunity shall be given to a student who has earned all the credits required by the respective program with CGPA greater than or equal to 4.00 but less than 4.50, to improve his/her grade by allowing him/her to appear for 100% examinations of maximum two theory courses of seventh and eighth semester. However, CGPA shall be limited to 4.5 even though the performance of a student as calculated through modified CGPA becomes greater than 4.5.

Computer Science and Technology
Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs) of the Program:

Program Educational Objectives (PEOs):	
PEO1	To create graduates with sound learning of basics of Computer Science and Technology who can contribute towards propelling Science and Technology.
PEO2	To create graduates with adequate abilities in Computer Science and Technology who can progress towards becoming developers, researchers and designers to fulfill the necessities of Computer Industries.
PEO3	To develop among students capacity to figure, formulate, analyze and solve real life problems confronted in Software Enterprises.
PEO4	Graduate will exhibit professionalism, ethical attitude, communication ability, collaboration in their profession and adapt to current trends by engaging in lifelong learning.
Program Outcomes (POs)	
PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the Information to provide valid conclusions.
PO5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective

	presentations, and give and receive clear instructions.
PO11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Recognize the need for, and have the preparation and ability to engage in Independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes(PSOs)	
PSO1	Provide effective and efficient knowledge of technology and free open source software (FOSS)through IIT Bombay Spoken Tutorial Project
PSO2	To create the awareness of foreign language among students to meet global needs and look for opportunities in multinational companies.
PSO3	Provide platform to students to develop a new and innovative project which will improve local industry needs.

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Semester V**							
Course Title	:	**System Programming**					*Course Code:*	:	**CS311**
Teaching Scheme (Hours)	:	3 hr /week= 3 x13= 39 hours					*Credits*	:	03
Evaluation Scheme (Marks)	:	CIE=50 SEE= 50	+	IPE IOE EPE/EOE	: :	=100	*Duration of Exam*	:	3 Hrs
Revision:	:	Third					*Month*	:	June 2018

Pre-requisites	**:**	The knowledge of Computer Organization and Programming
Type of Course	**:**	Theory
Course Domain	**:**	Core (Assembler, Compiler, Interpreter)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during Continuous Internal Evaluation (Internal Test I and Internal Test II) and Semester End Examination.

Course Objectives:

Student will try to :

1. Conceptualize the fundamentals of language specifications.
2. Acquire the knowledge of different passes of assemblers
3. Learn how assembler handles macros calls
4. Acquire the knowledge of how compiler and interpreter works
5. Get the knowledge of how compiler loads program in memory for execution and how it links macros
6. Familiarize with various software development tools.

Course Outcomes:

Student will be able to

1. Identify different types of system software and language specifications.
2. Design one pass and two pass assembler and working
3. Design and Develop assembler for macro expansion
4. Describe working, advantages and disadvantages of compiler and interpreter
5. Describe how program gets loaded into memory at the time of execution.
6. Understand different programming environment and deployment tools.

Curriculum Content	**Hours**
Unit I: Language Processors Introduction, Language processing activities, Fundamentals of language processing, Fundamentals of language specification, Language processor development tools.	5

Unit II: Assemblers Elements of assembly language programming, a simple assembly scheme, pass structure of assemblers, design of a two pass assembler, a single pass assembler for IBM PC.	8
Unit III: Macro Processors Macros facility, Macro definition and call, Macro Expansion, Nested macro calls, Advanced macro facilities, Design of macro preprocessor.	6
Unit IV: Compilers and Interpreters Aspects of compilation, memory allocation, compilation of expressions, compilation of control structures, code optimization, Interpreters.	7
Unit V: Linkers & Loaders Relocation and linking concepts, design of a linker, Self-relocating programs, a linker for MS DOS, Linking for overlays, Loaders.	8
Unit VI: Software Tools Software tools for program development, Editors, Debug monitors, Programming Environments, User interfaces, DLLs	5

Text Books	**:**	
		1. "System Programming and Operating Systems", D. M. Dhamdhere, TMGH, 2nd Edition.
Reference Books	**:**	

1. "System Programming", J. J. Donovan, Mc-Graw Hill.
2. "Systems Programming" by A A Puntambekar and I A Dhotre
3. "System Programming and Compiler Construction (Includes Labs)" by R K Maurya and Anand A Godbole

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology Part-III, Sem-V**					
Course Title	:	**Computer Algorithm**				*Course Code*:	: **CS311**
Teaching Scheme (Hours)	:	3 hours/weeks=3x 13 weeks= 39 hrs minimum				*Total Credits*	: *03+01=04*
		Tutorial= 1hr/week					
Evaluation Scheme (Marks)	:	CIE = 50 SEE = 50	+	IPE IOE EPE/EOE	: : :	= 100	*Duration of SEE* : 3 Hrs
Revision:	:	Third				*Month*	: June 2018

Pre-requisites	**:**	
Data structures and Knowledge of mathematics		
Type of Course	**:**	Theory
Course Domain	**:**	Core (Computer Algorithm)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during the Continuous Internal Evaluation (Internal Test I and Internal Test II) and Semester End Examination.

Course Objectives:

1.To learn mathematical background for analysis of algorithm
2. To understand the concept of designing an algorithm.
3. To learn dynamic programming and greedy method.
4. To understand the concept of pattern matching
5. To learn advanced tree and graph applications.
6. To learn non deterministic and deterministic algorithm.

Course Outcomes:

Students will be able to

1. Understand asymptotic notations to analyze the performance of algorithm
2. Choose appropriate advanced data structure for given problem.
3. Apply the dynamic programming technique and greedy programming technique to solve the problems.
4. Select a proper pattern matching algorithm for given problem.
5. Apply algorithms for performing operations on graphs and trees
6. Analyze deterministic and non deterministic algorithm to solve complex problems

Curriculum Content	**Hours**
Unit 1 Introduction What is algorithm, Algorithm Specification, Performance Analysis, heap.	5
Unit 2 Divide and Conquer The general method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort, and analysis of these algorithms.	7
Unit 3 The Greedy Method The general method, Knapsack problem, Job sequencing with deadlines, minimum-cost spanning trees – Prim's and Kruskal's Algorithms, Optimal storage on tapes, Single source shortest paths.	7
Unit 4 Dynamic Programming The general method, Multistage graphs, All pair shortest paths, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Sales person problem.	6
Unit 5 Backtracking The general method, 8-queen problem, sum of subsets, Knapsack Problem, Hamiltonian Cycle, and Graph Coloring.	6
Unit 6 Basic Traversal and Search Techniques and Polynomial Problems Techniques for Binary Trees, Game Tree; Techniques for Graphs – Breadth First Search & Traversal, Depth First Search & Traversal, AND/OR graphs; Connected components and Spanning Trees; Bi-connected components and depth first search. NP Hard and NP Complete.	8

Text Books	**:**	
		1. *"Fundamentals of Computer Algorithms",* Horowitz, Sahni and Rajasekaran, Galgotia Publications.
Reference Books	**:**	

1. *"Fundamentals of Computer Algorithms",* Horowitz and Sahni, Galgotia Publishers.
2. *"Design and Analysis of Algorithms",* Aho, Hopfcraft and Ullman, Addison Wesley.
3. *"Introduction to Algorithms",* Thomas Cormen, PHI Publication.
4. *"Introduction to Design and Analysis of Algorithm",* Goodman, McGraw Hill.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology) Part-III, Sem-V**					
Course Title	:	**Operating System-I**			*Course Code*:	:	CS313
Teaching Scheme (Hours)	:	3 hours/weeks=3x 13 weeks= 39 hrs minimum			*Total Credits*	:	*03+01=04*
		Tutorial= 1hr/week					
Evaluation Scheme (Marks)	:	CIE = 50 SEE = 50	IPE IOE EPE/EOE	: : : = 100	*Duration of SEE*	:	3 Hrs
Revision:	:	Third			*Month*	:	June 2018

Pre-requisites	**:**	
Data Structures, knowledge of C and Fundamentals of Computer Systems		
Type of Course	**:**	Theory
Course Domain	**:**	Core (Operating System)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during the Continuous Internal Evaluation (Internal Test I and Internal Test II) and Semester End Examination.

Course Objectives:

1. To provide a clear understanding of the concepts of operating system with basic aspects.
2. To develop the conceptual understanding of process, process scheduling and synchronization.
3. To develop the understanding of deadlocks and to analyze them related to common circumstances in operating systems.

4. To understand different approaches to memory management, virtual memory and different paging algorithm.
5. To understand the overview of I/O system and kernel I/O subsystem.

Course Outcomes:

Students will be able to

1. Study the different types of operating systems.
2. Understand the basic concept of process and process scheduling algorithms used in operating system.
3. Give the extensive knowledge of memory management and deadlock handling algorithms.
4. Understand various concepts of I/O application and kernel I/O subsystem.
5. Analyze various algorithms required for management, scheduling, allocation and communication used in operating system.

Curriculum Content	Hours
Unit: I Introduction What is an operating system?, Simple Batch System, Multi programmed Batch System, Time Sharing System, Personal Computer System, Parallel System, Real Time System, System Calls.	5
Unit: II Process Process Concept, Process Scheduling, Operation on process, Cooperating process, Threads, Inter process communication (Algorithm evaluation). Process Scheduling: Basic concept, Scheduling Criteria, Scheduling Algorithms, Multiple processor scheduling, real time scheduling.	**8**
Unit: III Interprocess Synchronization Background, Classical problems of synchronization, Critical Region, The critical section problem, Synchronization Hardware Monitors, Semaphores.	**5**
Unit: IV Deadlocks System modes, Deadlock characterization, Methods for handling, deadlocks Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, combined approach to dead lock.	**7**
Unit: V Memory Management Background, Logical Versus Physical Address space, Swapping Contiguous Allocation, Paging, Segmentation, Segmentation with paging. Virtual Memory: Background, Demand paging, Page replacement, Page replacement algorithms, Allocation of frames, Thrashing, Demand segmentation.	**9**
Unit: VI I/O System Overview, I/O hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O request to hardware operation.	**5**

Text Books	**:**	
		"Operating System Concepts", Silberschatz Galvin, John Wiley, 5th Edition.
Reference Books	**:**	
1."Operating System Concepts and Design " , Milan Milenkovic TMGH Second Edition 2. "Operating System A Design Oriented Approach", Charles Crowley, TMGH. 3. "Operating System with Case Studies in Unix, Netware and Windows NT", Achyut S. Godbole, TMGH.		

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Sem V**									
Course Title	:	**Software Engineering**							*Course Code*:	:	**CS314**
Teaching Scheme (Hours)	:	3 hr /week=3x13= 39 hrs Tutorial=NA							*Credits*	:	03
Evaluation Scheme (Marks)	:	CIE SEE	: :	50 50	IPE IOE EPE/ EOE	: :	= 100		*Duration of Exam (in case of External Evaluation)*	:	3 Hours
Revision:	:	Third							*Month*	:	June 2018

Pre-requisites	**:**	Fundamental concepts and techniques for analysis, design and implementation of computer programming.
Type of Course	**:**	Theory
Course Domain	**:**	Core (Basic Computer Science)
Skills Imbibed	**:**	Cognitive
Course Assessment Methods: Student is evaluated during the Continuous Internal Evaluation (Internal Test I and Internal		

Test II) and Semester End Examination.

Course Objectives:

1. To know basic SW engineering methods and practices, and their appropriate application.
2. A general understanding of software process models and software requirements.
3. To know the role of project manager, different software architectural styles, and implementation issues.
4. To understand software testing approaches and its related issues.
5. An understanding of quality control and how to ensure good quality software.
6. To explain some ethical and professional issues that are important for software engineers and development of significant teamwork and project based experience.

Course Outcomes:

Students will be able to

1. Apply the project management and analysis principles to S/W project development.
2. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
3. Identify and solve engineering problems and to gain Knowledge about software development life cycle.
4. Communicate effectively and the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
5. Apply the design & testing principles to software project development to maintain software systems.
6. Identify and Apply methods for software quality and its control.

Curriculum Content	Hours
Unit: I Introduction & Software Processes: The S/W problem, S/W applications, the S/W Engineering Approach & Benefits. Software Process, Characteristics of a software process, Software development process, project management process, Software configuration management process, process management process	6
Unit:II S/W requirements Engineering & Planning Software Project: S/W requirements, problem Analysis, Requirements Specification, validation, metrics. Project Management Plan, a. Cost estimation, project scheduling, staffing and personnel planning. b. Software Configuration Management plans, Quality Assurance plans. c. Project Monitoring Plans, Risk Management.	7

Unit:III Software Design: Objective, Design principles, module level concepts, Design notation and specifications, Artifacts system design document & detailed design document, Structured Design methodology, Verification, Metrics.	6
Unit:IV Object Oriented Design with UML: Introduction , Object Technologies, Unified Process, Use Case Model : methods, Use Case View - Use Case diagrams, Activity diagrams, Design Views- Class Diagrams, Interaction Diagrams, State Chart Diagrams, Process View- Class and Interaction Diagrams, Implementation View- Component Diagrams, Deployment View- Deployment Diagrams. (Case studies on UML views for business requirements).	**7**
Unit:V Coding & Software Testing: Programming Practice, verification, Metrics: Testing Fundamentals, Testing Levels, Functional testing, Structural testing, Testing object oriented programs, Regression Testing, Testing process Metrics-Reliability Estimation.	8
Unit:VI Software Quality & Project Monitoring and Control: Objectives, need for improvement, cost of Quality, Software quality factors, Total Quality Management, Quality standards such as ISO, CMM and CMMI along with their comparison, Six Sigma Project Manager Skills, Team management, Project tracking, milestone analysis, Activity – level Analysis using SPC, Defect Analysis and prevention, Process monitoring and Audit.	5

Text Books	**:**	
		1. *"An integrated approach to S/W engineering",* Pankaj Jalote, Narosa Publishers, 2nd Edition. 2. *"Software Project Management in practice",* Pankaj Jalote, Pearson Education.
Reference Books	**:**	

1. *"Software Engineering: Practitioner's Approach",* Roger S. Pressman.
2. *"Software Engineering",* Jawadekar W.S, TMGH.
3. *"Managing Software Engineering: CASE studies and solutions",* Gillies A.C. and Smith P,
Chapman and Hall, London.
4. *"Object oriented software concepts",* Bertrand Mayer.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology), Part III, Sem V**								
Course Title	:	**Computer Graphics and Multimedia Techniques**						*Course Code*:	:	**CS315**
Teaching Scheme (Hours)	:	3 hr /week=3x13= 39 hrs						*Credits*	:	03
Evaluation Scheme (Marks)	:	CIE SEE	: :	50 50	IPE IOE EPE/ EOE	: :	= 100	*Duration of Exam*	:	3 Hours
Revision:	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	The prerequisite for this course is basic knowledge of Computer Systems, Matrix Algebra, Calculus in Three Dimensions, or equivalents.
Type of Course	**:**	Theory
Course Domain	**:**	**Core**
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during Continuous Internal Evaluation (Internal Test I and Internal Test II) and Semester End Examination.

Course Objectives:

1. To introduce the use of the components of a graphics system and become familiar with graphics system components and algorithms.
2. To learn the basic principles of three- dimensional computer graphics.
3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
4. Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
5. To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.
6. To comprehend and analyze the fundamentals of animation, underlying technologies, principles, and applications.

Course Outcomes:

1. To list the basic concepts used in computer graphics.
2. To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. To describe the importance of viewing and projections.
4. To define the fundamentals of animation, virtual reality and its related technologies.
5. To understand a typical graphics pipeline.
6. To understand the principles of multimedia techniques.

Curriculum Content	Hours
Unit 1 Introduction to Graphics Devices: Display Devices and Adapters, Working of Printers, LCD Display.	3
Unit 2 Transformations: Basic 2D & 3D transformations - Translation, Scaling, Rotation, Reflection, Shearing, Multiple Transformations, Rotation about an axis parallel to a coordinate axis, Rotation about an arbitrary axis in space, Affine and Perspective Geometry, Orthographic projections and Axonometric projections.	8
Unit 3 Raster Scan Graphics: Bresenham's line and circle drawing algorithms, Scan Conversion techniques: RLE, Frame Buffer, Scan converting polygons: Edge fill and Seed fill algorithms, Anti-aliasing and Half-toning.	7
Unit 4 Viewing and Clipping: Introduction, Windowing and View-porting, Introduction to clipping, Point clipping, Line clipping: Sutherland - Cohen line clipping algorithm.	6
Unit 5 Curves and Surfaces Curve Representation, Non-parametric and parametric curves, representation of space curves, Cubic Spline, Parabolic Blended curves, Bezier curves and B-spline curves, Z- buffer, Warnock algorithm.	8
Unit 6 Multimedia Applications Media preparation, composition, integration, communication, entertainment using commercial tools	7

Text Books	**:**	
		3. "Mathematical elements for Computer Graphics" - David F. Rogers, J. Alan Adams (MGH Int.) (For chapters 1, 2, 5) 4. "Procedural elements for Computer Graphics" - David F. Rogers, (MGH Int.) (For chapters 3, 4) 5. "Multimedia Making it Work", Tay Vaughan, TMGH, 5th Edition. 6. "Multimedia Communication", Fred Halsall, Pearson Education.

Reference Books	**:**	

1. Newman Sproul, "Principles of Interactive Computer Graphics" - (MGH) (chapters 1,4)
2. Prof. Rajesh Maurya, "Computer Graphics" (Wiley India Pvt. Ltd.) (Chapter 4)
3. Hearn & Baker, "Computer Graphics".
4. Ranjan Parekh, "Principles of Multimedia", TMGH

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Semester V**								
Course Title	:	**System Programming Lab**						*Course Code*:	:	**CS311L**
Teaching Scheme (Hours)	:	2 hr /week=2x13= 26 hrs						*Credits*	:	01
Evaluation Scheme (Marks)	:	IPE IOE	: :	+	EPE=50 EOE	: :	=50	*Duration of Exam (in case of External Evaluation)*	:	3 Hrs
Revision:	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	The knowledge of Computer Organization and Programming
Type of Course	**:**	Practical
Course Domain	**:**	Core (Assembler)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during External Practical Oral Examination.

Course Objectives:

Student will try to :

1. Learn different methods of token separation
2. Acquire the knowledge of assemblers
3. Acquire the knowledge of handling macros calls by assembler
4. Get the knowledge of generation of Symbol table by compiler
5. Conceptualize working of linker
6. Conceptualize working of loader

Course Outcomes:

Student will be able to describe

1. Separation of token from a statement.
2. Syntax error generation task of compiler
3. Expansion of macros by pre assembler
4. Generation of symbol table
5. Linker links subroutines in main program.
6. How loader calculates address.

Practical covered	**:**	Expected minimum 8-10 experiments based on following

1. Design Lex specifications for the tokens-keywords, identifiers, numbers, operators, white spaces.
2. Checking for syntax error.
3. Required memory calculation.
4. Implementation of Macros.
5. Implementation of Nested macros.
6. Design and implementation of 1 pass assemblers.
7. Design and implementation of 2 pass assemblers.
8. Symbol table generation for input *.c file.
9. Implementation of Toy-code generator.
10. Simulation of linkers.
11. Simulation of loaders.
12. 3-4 assignments on DLL on Linux shared library.
13. Use of different debugger tools.

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Sem V**								
Course Title	:	**Computer Graphics and Multimedia Techniques Lab**						*Course Code*:	:	**CS312L**
Teaching Scheme (Hours)	:	2 hr /week=2x13= 26 hrs						*Credits*	:	01
Evaluation Scheme (Marks)	:	CIE SEE	: :	+	IPE EPE=50	: :	=50	*Duration of Exam (in case of External Evaluation)*	:	3 Hrs
Revision:	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	The prerequisite for this course is basic knowledge of Computer Systems, C Programming Language, Matrix Algebra, Calculus in Three Dimensions, or equivalents.
Type of Course	**:**	Practical
Course Domain	**:**	Applied Science, Core
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during External Practical Examination.

Course Objectives:

1. To introduce and understand the structure of modern computer graphics
2. To implement the basic principles of three- dimensional computer graphics.
3. To implement scan conversion of the basic geometrical primitives and to transform the shapes to fit them as per the picture definition and familiarize with key algorithms for modeling and rendering graphical data
4. To design the mapping from a world coordinates to device coordinates, clipping, and projections.
5. Develop design and problem solving skills with application to computer graphics.
6. To comprehend and analyze the fundamentals of animation, underlying technologies, principles, and applications.

Course Outcomes:

1. To explain the mathematical and theoretical principles of computer graphics eg: To draw basic objects like lines, triangles and polygons.
2. To use matrix algebra in computer graphics and implement fundamental algorithms and transformations involved in viewing models.
3. To write basic graphics programs for projection models, illumination models and handling of hidden surfaces and clipping in computer graphics.
4. To analyze and evaluate the use of computer graphics methods in practical applications and describe effects such as antialiasing.
5. To apply computer graphics techniques to creating aesthetic effect.

Practical covered	**:**	

1. Study of Computer graphics devices adapters and multimedia storage devices
2. Two Dimensional transformations
3. Three Dimensional transformations and animations
4. Generalized Bresenham's line drawing algorithm
5. Bresenham's circle drawing algorithm
6. Polygon filling algorithm
7. Clipping algorithms like two dimensional clipping, Sutherland Cohen Clipping
8. Windowing

9. Hidden line and surfaces
10. Bezier curve
11. Compression technique algorithms for text, image and video
12. Study of mm file formats and conversions (BMP-JPG,WAV-MP3,DAT-MPEG)
13. Application software/animation using multimedia concepts
14. GIF animator / Flash /3D Max/Maya etc.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology), Part III, Sem V**								
Course Title	:	**Java Programming Lab**						*Course Code*:	:	**CS316L**
Teaching Scheme (Hours)	:	Theory:2hr/week=2x13=26hrs Practical:4 hr /week=4x13= 52 hrs						*Credits*	:	04
Evaluation Scheme (Marks)	:	IPE=50 IOE	:	+	EPE=50 EOE	:	=100	*Duration of Exam (in case of External Evaluation)*	:	03 hours
Revision:	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	
Knowledge of Programming Methodology, C, C++ or Object-Oriented language		
Type of Course	**:**	Practical
Course Domain	**:**	Core (Data Structures, Object Oriented Design & Programming)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Practical Journal Assessment, Internal Oral Examination and External Practical Examination

Course Objectives:

1. To know fundamentals of programming such as variables, conditional and iterative Execution, methods, etc.
2. To gain knowledge of fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.

3. To be aware of the important topics and principles of software development.
4. To have the ability to write a computer program to solve specified problems.
5. To be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

Students will be able to

1. Generate an application based upon the concepts of java & advanced java.
2. Understand the structure and model of the Java programming language.
3. Understand the network and security programming using Java and know about the application of dynamic page functionality in web pages using CGI, Servlets, JSP, ASP.
4. Create and communicate between client and server using Java and create a good, effective and dynamic website.
5. Choose an engineering approach to solve problems, starting from the acquired knowledge of programming and knowledge of operating systems.

Practical covered	**:**	

1. Implement java program to:
    a. determine which season a particular month is in using if else if ladder
    b. To perform arithmetic operations on two numbers using switch statements.
    c. To find number is prime or not using for statement.

2. Implement java program to study concept of class.
    a) Calculate area of rectangle, square, triangle using class Area_of_ figure.
3. Implement java program for method overloading & Constructor overloading.
4. Implement java program to study static member of the class.
5. Implementation of java program for understanding inner class concept and scanner class.
6. Implement java program to use of super keyword.(Inheritance Concept)
7. Implement java program for method overriding & dynamic method dispatch.
8. Implement java program to import own package.
9. Implement java program for implementing interface.
10. Implement java program for exception handling:
    a) Built in exceptions
    b) User defined exceptions.
11. Implement java program for multithreading.
12. Implement java program for reading data from keyboard.
13. Implement java program for:
    a. Reading data from file.
    b. Writing data to file.
    c. Implement java program for applet.
14. Implement java program for string handling:
    a. Concatenate two strings.
    b. To change case of characters.
    c. For searching strings.
15. Implement java program for Applet.
16. Implement java program for RMI.

17. Implement java program for db programming with JDBC. 18. Design GUI based form to register user & authenticate it. 19. Implement java applet to generate random color rectangles.
Text Books **:**
1. "Core Java Fundamentals Vol –I", Cay S. Horstmann, Gary Cornell, The Sun Microsystems Press Java Series. *2. "Core Java Vol – II", Cay S. Horstmann, Gary Cornell, The Sun Microsystems Press Java Series.* *3. "Database Programming with JDBC and JAVA", Grorge Reese, O'REILLY.*
Reference Books **:**
1. *"Java 2 Complete Reference",* Herbert Schildt, TMGH, 5th Edition. 2. *"How to Java",* Dietel & Dietel.

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Sem V**								
Course Title	:	**Seminar**						*Course Code*:	:	**CS317**
Teaching Scheme (Hours)	:	2 hr /week=2x13= 26 hrs						*Credits*	:	01
Evaluation Scheme (Marks)	:	IPE IOE	: :	NIL 50	EPE EOE	: :	=50	*Duration of Exam*	:	2 Hrs
Revision:	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	Soft Skills
Type of Course	**:**	Practical
Course Domain	**:**	Humanity, Management
Skills Imbibed	**:**	Affective

Course Assessment Methods:

Student is evaluated during Internal Oral Examination

Course Objectives:

1. To develop effective communication skills.
2. To develop effective presentation skills.
3. To compete successfully in the business environment.
4. To develop ability to perform close and critical readings.
5. To identify, understand and discuss current, real-world issues.

Course Outcomes:

1. To develop learning tools that will help to be life-long learners.
2. To investigate current scientific issues facing society.
3. To acquire practice skills those are necessary for any academic learner.
4. To get acquainted with the organization structure, business operations and administrative functions.
5. To create and convey verbal and non-verbal method of communication that demonstrates respect and understanding in a complex society.

Practical covered	**:**	

Every individual student has to select a technical and field relevant topic for seminar and he or she has to deliver the same in the class. Seminar should consist of a presentation of about 30-40 minutes by every individual student. The main objectives of seminar are to provide exposure to latest developments and trends in Computer Science and Technology and to prepare a detailed seminar report for submission and evaluation. A report on the seminar should be submitted to the department. Assessment should be jointly done by panel of teachers consisting of respective guide and other teachers from the department.

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Semester V**								
Course Title	:	**Research Methodology**						*Course Code*:	:	**RM311**
Teaching Scheme (Hours)	:	2 hr /week= 2 x13= 26 hours						*Credits*	:	Nil
Evaluation Scheme (Marks)	:	Assignments Viva voce	: :	50 25	Written Test Grand Total	: :	25 100	*Duration of Exam*	:	Not Applicable
Revision	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	H.S.C level English Language Competency
Type of Course	**:**	Audit Course at institute level
Course Domain	**:**	Research Skills
Skills Imbibed	**:**	Cognitive: Understand, Predicting Situation, Comprehend, Affective : Receive, Listen, Respond, Showing self-reliance, Organize Psychomotor: Imitation, adaptation, articulation, origination

Course Assessment Methods:

The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives:

1. To gain familiarity with research phenomenon or to achieve new insights into it (known as exploratory or formulate research studies) ;
2. To develop an understanding of various research designs and techniques;
3. To identify various sources of information for literature review and data collection;
4. To judge the frequency with which something occurs or with which it is associated with something else (known as diagnostic research studies);
5. To know about testing a hypothesis of a causal relationship between variables (known as hypothesis-testing research studies) ;

Course Outcomes: At the end of the course, the students

1. Will be able to understand some basic concepts of research and its methodologies;
2. Will be able to identify appropriate research topics ;
3. Will be able to select and define appropriate research problem and parameters;
4. Will be able to prepare a project proposal (to undertake a project) ;
5. Will be able to organize and conduct research (advanced project) in a more appropriate manner

write a research report;

Curriculum Content	**Hours**
Unit I: Introduction to Research: Definition and basic Types of research, Research process and steps in it, Concept of Hypothesis, Research proposals and aspects.	**03**

Unit II: Basic Statistics required for any research Introduction to Descriptive Statistics, Statistical data, Variable, Classification of data, exploratory data analysis, Measures of central tendency, Dispersion-Standard deviation, Correlation and regression analysis.	**06**
Unit III: Introduction to Design of Experiment: Concept of design of experiment, its objectives, strategies, Factorial experimental design, designing engineering experiments, basic principles, of replication. Guidelines of experiments.	**06**
Unit IV : Single Factor Experiment: Hypothesis testing, Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effects model, Estimation of variance components, goodness of fit tests, Chi-Square test, Kolmogorov-Smirnov(K-S) test.	**07**
Unit V: Two factor Factorial Design: Basic definitions and principles, main effect and interaction, response surface and contour plots, General arrangement for a two-factor factorial design; Models-Effects, means and regression, Hypothesis testing.	**07**
Reference Books **:**	
1. Kothari, C.R., Research Methodology –Methods and techniques, New Age Publications, New Delhi, 2009. 2. Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, Wiley India. 3. Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers, Wiley India. 4. J.Medhi, Statistics Methods, New Age Publications, New Delhi 2009. 5. Nabendu Pal and Saheb Sarkar, Statistics: Concepts and Applications, Prentice Hall of India Pvt.Ltd. New Delhi, 2004. 6. Panneerselvam, R., Research Methodology, Prentice-Hall of India, New Delhi, 2004.	

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Semester VI**							
Course Title	:	**Compiler Construction**					*Course Code*:	:	**CS321**
Teaching Scheme (Hours)	:	Theory 3 hr /week= 3 x13= 39 hours Tutorial 1 hr/week= 1X13=13 hours					*Credits*	:	04
Evaluation Scheme (Marks)	:	CIE=50	:	+	SEE =50	: =100	*Duration of Exam*	:	3 Hrs
Revision:	:	Third					*Month*	:	June 2018

Pre-requisites	**:**	The knowledge of System Programming
Type of Course	**:**	Theory
Course Domain	**:**	Core (Compiler)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during Continuous Internal Evaluation (Internal Test I and Internal Test II) and Semester End Examination.

Course Objectives:

Student will try to:

1. Initiate an understanding of compilers in general and brief about phases of compiler.
2. Conceptualize how compiler makes tokens in Lexical analysis
3. Explore how grammar will be used in finding syntax error
4. Learn how compiler builds syntax tree and allocates the memory
5. Optimize the machine code generated by the compiler to make it faster and more efficient
6. Understand how machine language code will be generated from intermediate code

Course Outcomes:

Student will be able to

1. Describe different phases of compiler.
2. Implement generation of token in Lexical analysis.
3. Identify checking of code for syntax errors using grammar.
4. Understand steps for generating syntax tree and memory allocation.
5. Implement generation of intermediate code and applying optimization principles on for code optimization.
6. Apply optimization principles on given code for e machine code generated by the compiler to make it faster and more efficient.

Curriculum Content	**Hours**
Unit I: Introduction Compilers, Phases of a compiler, Compiler construction tools, A simple one pass compiler.	4
Unit II: Lexical Analysis Role of a Lexical analyzer, input buffering, specification and recognition of tokens, finite automata implications, designing a lexical analyzer generator.	7

Unit III: Syntax Analysis Role of Parser, Writing grammars for context free environments, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers.	9
Unit IV: Syntax Directed Translation and Run Time Environments Syntax directed definitions, construction of syntax tree, Source language issues, storage organization and allocation strategies, parameter passing, symbol table organizations and generations, dynamic storage allocations.	7
Unit V: Intermediate Code Generation Intermediate languages, declarations, assignment statements and Boolean expressions, case statements, back patching, procedure calls.	5
Unit VI: Code Generation Issues in design of a code generator and target machine, Run time storage management, Basic blocks and flow graphs, Next use information and simple code generator, Issues of register allocation, assignment and basic blocks, code generation from Dags and the dynamic code generation algorithm.	7

Text Books	:	
		"Compilers - Principles, Techniques and Tools", A.V. Aho, R. Shethi and J.D.Ullman, Pearson Education
Reference Books	:	

1. "Compiler Construction", Dhamdere, Mc-Millan.
2. "Compilers - Principles, Techniques and Tools", A.V. Aho, R. Shethi and J.D.Ullman, Addison Wesley Publishing Company.
3. "Compiler Construction", Barret, Bates, Couch, Galgotia.
4. "Unix Programming", Pepkin Pike.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology) Part-III, Sem-VI**							
Course Title	:	**Operating System-II**					*Course Code*:	:	**CS322**
Teaching Scheme (Hours)	:	Theory 3 hours/weeks=3x 13 weeks= 39 hrs Tutorial=1hr/week=1 x13 weeks=13hrs					*Total Credits*	:	*03+01=04*
Evaluation Scheme (Marks)	:	CIE = 50 SEE = 50	+	IPE IOE EPE/EOE	: : :	= 100	*Duration of SEE*	:	3 hrs
Revision:	:	Third					*Month*	:	June 2018

Pre-requisites	**:**	
Basic concepts of Operating System and programming concepts		
Type of Course	**:**	Theory
Course Domain	**:**	Core (Unix Operating System)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during the Continuous Internal Evaluation (Internal Test I & Internal Test II) and Semester End Examination.

Course Objectives:

1. To understand the concepts, design, and structure of the UNIX operating system.
2. To develop the conceptual understanding internal of working of buffer cache and internal representation of files in UNIX OS.
3. To develop the understanding system calls and its internal working for the file

system in UNIX OS.

4. To develop the conceptual understanding structure of processes and process control in UNIX OS.
5. To develop the conceptual understanding memory management policies and the I/O subsystem of UNIX OS.

Course Outcomes:

Students will be able to

1. Analyze architecture of UNIX and windows operating system.
2. Conceptualize the knowledge of basic issues with fundamental of buffer cache and internal representation of files.
3. Study process and Structure of Process this covers a broad range of engineering aspects.
4. Understand various concepts of Process and Process Control.
5. Analyze basic issues in representation, scheduling, allocation and management in operating system.

Curriculum Content	Hours
Unit:I Introduction General Overview of the UNIX System - History, System Structure, User Perspective, Operating System Services, Assumption about Hardware, Introduction to system concepts, Kernel Data Structure, System Administration.	5
Unit:II The Buffer Cache Buffer headers, structure of the buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks, advantages and disadvantages of cache.	5
Unit:III Internal Representation of Files Inodes, structure of the regular file, directories, conversion of a pathname to inode, super block, inode assignment to a new file, allocation of disk blocks, other file types. System calls for the file System **:** Open,Read, write, File and Record Locking, Adjusting the position of FILE I/O-LSEEK, Close, File Creation,Creation of Special File, Change Directory and Change Root, Change Owner and Change Mode, Stat and Fstat, Pipes, Dup, Mounting and Unmounting file systems, Link, Unlink, File System Abstractions, File System maintenance.	10 5
Unit:IV The Structure of Process Process stages and transitions, layout of system memory, the context of a process, Saving context of a process, manipulation of the process address space.	9
Unit:V Process Control Process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process, the shell, System Boot and the Init process, Process Scheduling and Time : Process Scheduling, system call for time, clock.	5
Unit:VI Memory Management Policies	

Swapping, Demand passing, hybrid system with demand paging and swapping.		
Text Books	**:**	
		"The Design of Unix Operating System", Maurice J. Bach, PHI.
Reference Books	**:**	

1. *"Unix Concepts and Administration",* Sumitabha Das, TMGH, 3rd Edition.
2. *"Unix Shell Programming",* YeshvantKanetkar, BPB Publications.
3. *"Unix Utilities",* Tare, MGM.
4. *"Advanced Programming in the UNIX Environment",* Stevens and Rego, Pearson Education, 2nd Edition..

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology) Part III, Sem VI**					
Course Title	:	**Object Oriented Modelling and Design**				*Course Code*:	: CS 323
Teaching Scheme (Hours)	:	4 hours/weeks=4x 13 weeks= 52 hrs				*Total Credits*	: *04*
Evaluation Scheme (Marks)	:	CIE = 50 SEE = 50	IPE IOE EPE/EOE	:	= 100	*Duration of SEE*	: 3 hrs
Revision:	:	Third				*Month*	: June 2018

Pre-requisites	**:**	
Knowledge in basics of software engineering.		
Type of Course	**:**	Theory
Course Domain	**:**	Core(Software Engineering)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during the Continuous Internal Evaluation (Internal Test I & Internal Test II) and Semester End Examination.

Course Objectives:

1. To Create, Critique and Refine customer Use Cases.
2. To Transform Use Cases into Object Oriented software Realizations through Object Oriented Analysis and Object Oriented Design.
3. To Document your requirements, analysis, and design models in the Unified Modelling Language (UML) notation.
4. To apply techniques of state machines and design patterns to your designs.
5. To prepare Interaction of the real world system.
6. To develop Component and deployment view of the problem statement.

Course Outcomes:

Students will be able to

1. Know the concept of object-oriented development, and create a static object model and a dynamic behavioural model and a functional model of the system.
2. Use the approaches to system design and object design, and the techniques of translating design to implementation
3. Implement the object-oriented modelling and design patterns to provide solutions to the

real-world software design problems.
4. Describe how design patterns facilitate development.
5. Measure the Level of User satisfaction and software quality assurance.
6. Design all structural and behavioural views of the software system.

Curriculum Content	Hours
Unit: I Introduction: Object Oriented development and themes, evidence for usefulness, modeling as a Design Technique. Objects, classes, links and associations, generalization and inheritance, grouping constructs, aggregation, abstract classes, generalization as extension and restriction, multiple inheritance, metadata, candidate keys and inheritance.	9
Unit: II Dynamic and Functional Modeling Events, states, operations, concurrency, nested state diagrams, advanced dynamic modeling concepts, relation of object and dynamic models, DFD, relation of functional to object and dynamic models.	8
Unit: III Design Methodology Impact of an object oriented approach, Analysis, System design with examples, combining models, Designing models, designing Algorithms, Optimization of design, control. Associations, Physical packaging, Comparing methodologies using structure analysis and design, Jackson's structured Development Information modeling notation and object oriented works.	9
Unit: IV Structural Modeling using UML Classes, Relationships, Common mechanisms. Diagrams, Class Diagrams, Interfaces, Types and Roles, Packages, Instances and Object Diagram	8
Unit: V Behavioral Modeling using UML Interactions, Use cases, Use case diagram, Interaction Diagrams and Activity diagrams, Events and signals, State Machines, Processes and Threads, Time and space, State chart diagrams.	9
Unit: VI Architectural Modeling using UML Components, Deployment, Collaboration, Patterns and Frame works, Component Diagrams and Deployment Diagrams.	9

Text Books	:	
		1. "Object Oriented Modeling and Design", Rambaugh, Premerlani, Eddy, Lorenson, PHI. *2. "The Unified Modeling Language User Guide", Grady Booch, Jeams Rambaugh, Ivar Jacotson, Addison Wesley.*
Reference Books	:	

1. *"Object Oriented Analysis and Design",* Andrew High, TMG.
2. *"Practical Object Oriented Design with UML",* Mark Priestley.
3. *"Object Oriented Analysis and Design",* Kahate, TMH.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology) Part III, Sem VI**					
Course Title	:	**Database Engineering**			*Course Code*:	:	**CS324**
Teaching Scheme (Hours)	:	3 hours/weeks=3x 13 weeks= 39hrs minimum Tutorial= 1 hours/week			*Total Credits*	:	*03+01=04*
Evaluation Scheme (Marks)	:	CIE = 50 SEE = 50	IPE IOE EPE/ EOE	: : :	= 100	*Duration of SEE*	*:*	3hrs
Revision:	:	Third			*Month*	:	June 2018

Pre-requisites	**:**	
Basic knowledge of Programming.		
Type of Course	**:**	Theory
Course Domain	**:**	Core (Database , SQL , Transactions , Recovery)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during Continuous Internal Evaluation (Internal Test I & Internal Test II) and Semester End Examination.

Course Objectives:

1. To understand the role of a database management system in an organization and to describe a sound introduction to the discipline of database management systems and operations of relational algebra.
2. Apply logical database design Principles, including E-R diagrams and database normalization and to introduce the concepts of basic SQL as a universal Database Query language. Construct simple and moderately advanced database queries using Structured Query Language (SQL).
3. To enhance knowledge of advanced SQL topics like embedded SQL, procedures connectivity, design and implement a small database project.
4. To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques.
5. Describe the concept of a database transaction, related Database facilities, including concurrency control, Backup and recovery.

Course Outcomes:

Students will be able to

1. Explain the features of database management systems and Relational database with different issues such as design, implementation and its applications.
2. Design conceptual models of a database using ER model for real life applications and transform it to construct queries in Relational Algebra.
3. Create and Design SQL for a real life application, with constraints and keys.
4. Formulate complex queries with data manipulation language to query, update, retrieve and manage any type of information from the Database.
5. Apply database normalization principals to analyze the existing design of a database schema and to design an optimal database.
6. Create and construct indexing mechanisms for efficient retrieval of information.

Curriculum Content	**Hours**
Unit:I Introduction and Database Modeling using ER Model : General introduction to database systems and its advantages & applications, Database System Architecture, Database users and Administrator, Data models, Database management system, Database languages, View of Database, Data Models. ER Model, Entity set, Entity types, attributes, Notations, Relationship sets, Relationship types, Keys- super key, candidate key, primary key, Extended Features of ER Model-Generalization, Specialization and aggregation.	6
Unit:II Data Modeling and SQL : Concept of relations, Schema-instance distinction, Referential integrity and foreign keys, Relational algebra, Various types of joins, Tuple relation calculus, Domain relational calculus, Example queries, Introduction to SQL, Data definition statements with constraints, Update behaviors, Nested Queries, Aggregate functions group by and having clauses.	7
Unit:III Database Design : Importance of a good schema design, Motivation for normal forms, dependency theory - functional dependencies, Closure of a set of FD's, Definitions of 1NF, 2NF, 3NF and BCNF, Decompositions and desirable properties of them, Multi-valued dependencies and 4NF, Join dependencies and definition of 5NF.	6
Unit:IV Data Storage and Indexes File organizations, Primary, Secondary index structures, Various index structures - hash-based, Dynamic hashing techniques, Multi-level indexes, B+ tree indices, Multiple key access.	5

Unit:V Transaction Processing and Concurrency Control Concepts of transaction processing, ACID properties, Transaction states, Implementation of atomicity, isolation and durability, Serializability, Testing for serializability. **Concurrency Control:** Lock-based protocols, Timestamp - based Protocols, Validation - based Protocols, Multiple Granularities, Deadlock handling. **Unit: VI Recovery System** Failure classification, Storage structure, Implementation of stable storage, Recovery and Atomicity, Log based recovery, Checkpoints, Shadow Paging, Buffer management in crash recovery.	10 5

Text Books	**:**	
		1. "Database System Concepts", Abraham Silberschatz, Henry F. Korth and S.Sudarshan, Mc Graw Hill, 2002, 4th Edition.
Reference Books	**:**	

1. *"Database Management Systems",* Raghu Ramakrishnan and Johannes Gehrke, 2002, 3rd Edition.
2. *"Fundamentals of Database Systems",* Ramez Elmasri and Shamkant Navathe, Benjamin Cummings, 1999, 3rd Edition.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology) Part-III, Sem-VI**						
Course Title	:	**Engineering Economics**				*Course Code*:	:	**CS325**
Teaching Scheme (Hours)	:	3 hours/weeks=3x 13 weeks= 39 hrs minimum				*Total Credits*	:	*03*
		Tutorial= NIL						
Evaluation Scheme (Marks)	:	CIE = 50 SEE = 50	+	IPE IOE EPE/EOE	: : :	=100	*Duration of SEE*	: 3 hrs
Revision:	:	Third				*Month*	:	June 2018

Pre-requisites	**:**	
Basic Knowledge of economics & mathematics		
Type of Course	**:**	Theory
Course Domain	**:**	Management
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during the Continuous Internal Evaluation (Internal Test I & Internal Test II) and Semester End Examination.

Course Objectives:

1. Discuss principles and economic analysis of decision making
2. Discuss cost concepts, make-versus-purchase studies
3. Analyze principles of money-time relationships
4. Work on cash flow analysis
5. Analyze supply and demand relations
6. Analyze breakeven point analysis and effects of inflation on money-time relationships

Course Outcomes:

Students will be able to

1. Develop a thorough understanding on engineering decision making
2. Understand the principles of economic analysis of design process
3. Understand the different costs(fixed cost, variable cost, direct cost, indirect cost, standard cost and opportunity cost)
4. Realize the money-time relationships
5. Understand price changes and inflation
6. Understand price and relations using graphical approach

Curriculum Content	Hours
Unit I Introduction to Economics Economics in Decision Making, Business Economics and Engineering, Supply and Demand Introduction, Demand analysis, Elasticity of Demand, Demand forecasting, Supply analysis, Elasticity of supply, Supply and Demand interaction.	7
Unit: II Consumer Behavior Demand and consumer behavior, Utility approach: Marshall's law: Diminishing utility and equi-marginal utility, Indifference curves, Revealed Preference approach.	4
Unit: III Production Function Cobb-Douglas production function, Economies of scale, Competition and types of Markets, Perfect and Imperfect competition, Monopoly, Monopolistic and oligopoly competition, Mergers & Acquisitions.	8
Unit: IV Money and National Income a) **Concepts of National Income:** GNP, GDP, GNI, Green GNP, GreenGDP, NNP, NNI, PCI. b) **Money:** Demand and Supply, Monetary and fiscal policies in India, Public finance. c) **Welfare Economics:** Benham, Pareto, Kaldor and Amartya Sen contribution. d) **Resource Economics:** Renewable and renewable resources, variation method.	7
Unit: V Inflation Price index, **Inflation:** Meaning, types, causes, measurements and effects, inflation and determination of interest rates, Measures to control (REPO rate C.R.R.) **Foreign Exchange Rates:** Fixed vs floating, P-P-P theory and current practices to decide exchange rates.	7
Unit: VI International Trade **Modern Theory:** Heckscher- Ohlin's comparative cost doctrine, Leontief paradox, Terms	

of trade and non-trade, trade barriers and WTO, Cost benefit analysis of FDI.	6

Text Books	**:**	
		1. "Managerial Economics", D.N. Dwivedi, Vikas Publishing. *2. "Macro Economics", D.N. Dwivedi, Tata McGraw Hill, New Delhi.* *3. "Micro Economics", D.M. Mithani.* *4. "Macro Economics", D.M. Mithani.*
Reference Books	**:**	

1. *"Modern Micro Economics",* Koutsoyiannis.
2. *"Fundamentals of Engineering Economics",* Park, Prentice Hall.
3. *"Economics",* Samuelson.
4. *"Growth Economics",* Sen A.K, Penguin Books, England.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology) Part III, Sem VI**							
Course Title	:	**Object Oriented Modeling and design Lab**					*Course Code*:	:	**CS323L**
Teaching Scheme (Hours)	:	Practical:2 hr /week=2x13= 26 hrs					*Credits*	:	*01*
Evaluation Scheme (Marks)	:	IPE IOE	+	EPE EOE= 50	: :	= 50	*Duration of Exam (in case of External Evaluation)*	:	03 Hrs
Revision:	:	Third					*Month*	:	June 2018

Pre-requisites	**:**	
Basics of software engineering.		
Type of Course	**:**	Practical
Course Domain	**:**	Core
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Practical Journal Assessment and External Oral Examination

Course Objectives:

1. To create a requirements model using UML class notations and use-cases based on statements of user requirements, and to analyze requirements models given to them for correctness and quality.
2. To Create the Object Oriented design of a system from the requirements model in terms of a high-level architecture description, and low-level models of structural organization and dynamic behavior using UML class, object, and sequence diagrams.
3. To comprehend enough Java to see how to create software the implements the Object Oriented designs modeled using UML.
4. To comprehend the nature of design patterns by understanding a small number of examples from different pattern categories, and to be able to apply these patterns in creating an Object Oriented design.
5. To Give Object Oriented design heuristics, patterns or published guidance, evaluate a design for applicability, reasonableness, and relation to other design criteria.

Course Outcomes:

Students will be able to

1. Master the concepts of Object Oriented modelling, designing and should have attained practical skills in applying these concepts.
2. Understand UML in detail, its diagrams as modelling tool for large and complex software systems.
3. Draw a Object Oriented model and implement it using UML tool.
4. Have better understanding of requirements cleaner designs and more maintainable systems.
5. Create use case, interaction & Deployment diagrams for documents that capture requirements of software system and that model the dynamic aspects of a software system.

Practical covered	**:**	

1. Introduction to OOMD.
2. Introduction of Star UML –
    a. Purpose , Installation,
    b. Uses
    c. Different types of UML Diagrams(Classification of UML Diagrams).
3. Study of Use case Diagram –
    a. Introduction,Purpose,
    b. Notations(components),
    c. Any systems Examples(at least 3)
4. Study of Class Diagram –
    a. Introduction, Purpose, Relation(Generalization, Aggregation, composition)
    b. Notations(components),
    c. Any systems Examples(at least 3)
5. Study of Interaction Diagram[Sequence Diagram] –
    a. Introduction, Purpose,
    b. Notations(components),
    c. Any systems Examples(at least 3)
6. Study of Interaction Diagram[Collaboration Diagram] –
    a. Introduction, Purpose,
    b. Notations(components),
    c. Any systems Examples(at least 3)
7. Study of Activity Diagram –
    a. Introduction, Purpose,
    b. Notations(components),
    c. Any systems Examples(at least 3)
8. Study of State Diagram –
    a. Introduction, Purpose,
    b. Notations(components),
    c. Any systems Examples(at least 3)
9. Study of Component Diagram –
    a. Introduction, Purpose,
    b. Notations(components),
    c. Any systems Examples(at least 3)
10. Study of Deployment Diagram –
    a. Introduction, Purpose,
    b. Notations(components),
    c. Any systems Examples(at least 3)

Text Books	**:**	

1. "Object Oriented Modeling and Design", Rambaugh, Premerlani, Eddy, Lorenson, PHI.
2. "The Unified Modeling Language User Guide", Grady Booch, Jeams Rambaugh, Ivar Jacotson, Addison Wesley.

Reference Books	**:**	

1. *"Object Oriented Analysis and Design",* Andrew High, TMG.
2. *"Practical Object Oriented Design with UML",* Mark Priestley.
3. *"Object Oriented Analysis and Design",* Kahate, TMH.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology) Part III, Sem VI**								
Course Title	:	**Database Engineering Lab**						*Course Code*:	:	CS324L
Teaching Scheme (Hours)	:	2 hr /week=2x13= 26 hrs						*Credits*	:	*01*
Evaluation Scheme (Marks)	:	IPE IOE	:50 :	50	EPE EOE	:50 :	50+50 = 100	*Duration of Exam (in case of External Evaluation)*	:	3 hrs
Revision:	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	
The prerequisite for this course is basic knowledge of database engineering and programming.		
Type of Course	**:**	Practical
Course Domain	**:**	Core (Database , SQL , Transactions , Recovery)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:

Student is evaluated during Internal Oral Examination and External Oral Examination.

Course Objectives:

1. To describe a sound introduction to the discipline of database management systems and to give foundation for ER Diagram and the usage of relational algebra.

2. To introduce the concepts of basic SQL as a universal Database Query language. Construct simple and moderately advanced database queries using Structured Query Language (SQL).
3. To enable the design of an efficient database design principles using normalization concepts.
4. To enable students to create indexes for databases.
5. Design and implement a small database project.

Course Outcomes:

1. Construct problem statements for real life applications and design a database for the same.
2. Design ER model for real life applications and to construct queries with Relational Algebra.
3. Create and populate queries using SQL to query, update and retrieve information from the Database.
4. Analyze and apply concepts of normalization to existing database schema.
5. Design and Implement indices for a database.
6. Design and Implement concurrency control protocol and database recovery protocol.

Practical covered	**:**	

1. **Draw ER diagrams** for different schemas & Convert them into tables (Assume any suitable schema). Apply normalization. Display constraints.
2. **Study of SQL.**
3. **Design the relational database** for any of the ER Model from assignment No.1 using SQL.
4. **Insert and Modify Database:** Implement queries to insert, update data in tables created in assignment 3 and store data in separate File / Table.
5. **View Data: Design queries** to view and retrieve table data.
6. **Canonical cover & Closure:** For given set of functional dependencies to find canonical cover & closure.
7. **B+ Tree Indexing Technique:** Write program to implement B+ Tree Index.
8. **Dynamic Hashing Technique:** Write program to implement Dynamic Hashing on the created data.
9. **Concurrency Control:** Write program to simulate any one concurrency control Protocol.
10. **Database Logs:** Write program to create logs of the activities of assignment 3 & 4. Choose either Immediate Log or Deferred Log.

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Semester VI**							
Course Title	:	**Advanced Programming Lab**					*Course Code*:	:	**CS326L**
Teaching Scheme (Hours)	:	Theory : 2 hr /week=2x13= 26 hrs Practical :2 hr /week=2x13= 26 hrs					*Credits*	:	03
Evaluation Scheme (Marks)	:	IPE IOE	:50 :	EPE EOE	:50 :	50+50= 100	*Duration of Practical Exam*	:	3 Hrs
Revision:	:	Third					*Month*	:	June 2018

Pre-requisites	**:**	The knowledge of Computer Architecture, Programming knowledge
Type of Course	**:**	Practical
Course Domain	**:**	Core (Application Programming)
Skills Imbibed	**:**	Cognitive

Course Assessment Methods:
Student is evaluated during Internal Practical Oral Examination and External Practical Oral Examination.

Course Objectives:
Student will be able to
1. Understand .net Architecture
2. Implement OOPS Concepts with C#
3. Implementing Inheritance, Exception Handling in C#
4. Use windows controls and to program them.
5. To develop user friendly application
6. Handle database in C#

Course Outcomes:
Student will be able to
1. Describe .net Architecture.
2. Write program using OOPS concepts in C#
3. Describe exception handling in C#
4. Implement inheritance in c#
5. Develop windows applications.
6. Handle data using ADO.net in C#.

Curriculum Content	Hours
Unit I: .NET Architecture The Relationship of C# to .NET, The Common Language Runtime, A Closer Look at Intermediate Language, Assemblies, .NET Framework Classes, Namespaces	2
Unit II: C# Basics Variables, Predefined Data Types, Flow Control, Enumerations, Arrays, Namespaces, The Main () Method, More on Compiling C# Files, Console I/O, Using Comments, The C# Preprocessor Directives, C# Programming Guidelines Classes and Structs, Class Members, Constructors, Constructor Overloading, Destructors .	3
Unit III: Inheritance, Exception Handling Types of Inheritance, Implementation Inheritance, Modifiers, Method Overloading, Method Overriding, Interfaces Exception classes , Introduction to Exceptions Exception handling, The Exception Class, C# Exception Handling Keywords, The Exception Chain, Nested Exception Handling, User-Defined Exception Classes	4
Unit IV Using Controls for Application Development *Control like* : Textbox, Button, Radiobutton, Checkbox, Listbox, Combobox etc *Different Properties like:* Name, Text, TabStop, TabIndex, Enabled, SelctionMode etc *Events like*: Keypress, Validating, Validated, Click, CheckedChanged, SelectionIndexChanged etc	7
Unit V: Other Controls like Menu and Containers Menu Strip, Status Strip, Tool Strip, Context Menu Strip, Group Box, Tab Control, Panel, Tab Control.	3
Unit VI: Using ADO.net ADO.NET object model ,Connected and disconnected environment, Data sets and data adaptors, Command object and data readers, Data tables, rows and columns, data grid view control, Data View, Constraints and relations.	7

Text Books:	
	1. Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner, Karli Watson, "Beginning C# 2008" – Wrox Publication 2. Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner, Karli Watson, "Professional C# 2008" – Wrox Publication
Reference Books:	
	1. Chapman "Teach yourself Visual C++ in 21days" Techmedia publications 2. Jon Bates & Tim Tompkins "Practical Visual C++" (PHI)

Class & Semester	:	**T. Y. B. Tech (Computer Science and Technology), Part III, Sem VI**								
Course Title	:	**Mini Project**						*Course Code*:	:	**CS327**
Teaching Scheme (Hours)	:	2 hr /week=2x13= 26 hrs						*Credits*	:	*01*
Evaluation Scheme (Marks)	:	IPE IOE	: :	NIL 50	EPE EOE	: :	NIL NIL	*Duration of Exam*	:	2 Hrs
Revision:	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	Seminar
Type of Course	**:**	Practical
Course Domain	**:**	Humanity, Management
Skills Imbibed	**:**	Affective

Course Assessment Methods:

Student is evaluated during Internal Oral Examination

Course Objectives:

1. To create awareness among the students to express technical ideas, strategies and methodologies in written form.
2. To enable students to work as a responsible member and possibly a leader of a team in developing software solutions.
3. To motivate students to self-learn new tools, algorithms, and/or techniques that contribute to the software solution of the project
4. To create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
5. To improve the team building, communication and management skills of the students
6. To enable students to develop a design solution for a set of requirements

Course Outcomes:

1. Acquire practical knowledge within the chosen area of technology for project development
2. Identify, analyze and handle programming projects with a comprehensive and systematic approach
3. Contribute as an individual or in a team in development of technical projects
4. Develop effective communication skills for presentation of project related activities
5. Formulate and propose a plan for creating a solution for the problem identified
6. To report and present the findings of the study conducted in the preferred domain

Practical covered	**:**	

The mini-project should be undertaken preferably by a group of 3 students who will jointly work and implement the mini-project. The group will select a project with the approval of the guide. A batch of practical / Tutorial will be divided into mini project groups. Mini project topics and the work for these groups in the batch will be guided by a teacher for the batch, preferably on one of the topics like Compiler Construction, Database Engineering, Operating System, Computer Graphics and Multimedia, Advanced Programming and latest developments and trends in Computer Science and Technology.

The teacher will periodically assess the performance of individual student in the mini project, jointly with a teacher of another batch. Project group will submit hardcopy project report along with project demonstration software in CD and/or project hardware gadget at the term end.

The IOE of mini project will be jointly conducted by appointed examiners.

Note: Use of Open source tools should be preferred.

Class & Semester	:	**T. Y. B.Tech (Computer Science and Technology), Part III, Semester VI**								
Course Title	:	**Introduction to Foreign Language**						*Course Code*:	:	**HS321**
Teaching Scheme (Hours)	:	2 hr /week= 2 x13= 26 hours						*Credits*	:	Nil
Evaluation Scheme (Marks)	:	Assignments Viva voce	: :	50 25	Written Test Grand Total	: :	25 100	*Duration of Exam*	:	Not Applicable
Revision	:	Third						*Month*	:	June 2018

Pre-requisites	**:**	As it is the introduction to the language, it has no any pre-requisites
Type of Course	**:**	Audit Course at institute level
Course Domain	**:**	Linguistics
Skills Imbibed	**:**	Cognitive: Understand, Predicting Situation, Comprehend, Affective : Receive, Listen, Respond, Showing self-reliance, Organize Psychomotor: Imitation, adaptation, articulation, origination

Course Assessment Methods:

The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives:

1. To make the students able to communicate and translate in foreign languages for the *technical and scientific documentation*, beneficial to Defense and other Government sector services.
2. To make them globally competent in the era of industrial liberalization.
3. To complement their core studies in international business.
4. To make them confident while opting for better career prospects in Multinational Companies (MNCs) for technical and scientific translation/ interpretation tasks while working for joint ventures or collaborative partnership.

Course Outcomes:

1. The students will be able to acquire a good knowledge the basic grammar of foreign language and learn Alphabet, Common Words and Phrases in foreign language.
2. The students will also be able to learn to read the simple texts in foreign language.
3. The students would be able to speak a little using the greetings, well wishes etc. in Foreign Language.
4. The students will learn to count numbers, answer to the questions like, what is your name, surname, tell age, and can initiate little communication in Foreign Language.
5. The students can also translate simple sentences in foreign language.

Curriculum Content	Hours
Unit I: General Information on Basic Grammar of the foreign language, Introduction to Alphabet.	**05**
Unit II: Gender of Noun, Number of Noun, Pronouns, Adjectives, Verbs and their usage in simple sentences, Numbers (up to 10), Simple Greetings in foreign language.	**05**
Unit III General Questions in foreign language, like What is your name/surname? Who/What is this? Etc.	**04**
Unit IV: Simple narration about self/family/friend/University in foreign language chosen for studies. Practicing the learnt topics in the class itself.	**05**
Unit V: Formation of simple sentences using Parts of Speech, Information on Cases, One or Two simple lessons from any book.	**05**
Unit VI: Basic information on Country & Culture of language under study.	**04**
Reference Books **:**	
1. V.N.Wagner and V. G.Ovsienko, Russian, People's Publishing House, New Delhi. 2. S. Khavronina and A. Shirochenskaya, Russian in Exercises. 3. Genki – Japan Times 4. Aural Comprehension in Japanese – Osamu & Nobuko Mizutani. 5. An Introduction to Modern Japanese - Osamu & Nobuko Mizutani. 6. Japanese for Today – Y. Yoshida. 7. Lagune 1(Full set), Published by Langers, (An imprint of Saraswati House Pvt.Ltd), New Delhi 1 10002 (India).	

Equivalence of Third Year B. Tech (Computer Science and Technology) Semester V and VI

The above detailed syllabus is a revised version of the Third Year B. Tech (**Computer Science and Technology**) Program being conducted by the Shivaji University at the Technology Department of the University. This syllabus is to be implemented from June 2018, (Academic year 2018-19). The prime feature of this revision is the transformation of the existing curriculum into the Outcome based curriculum as specified in NBA rules and regulations.

The Equivalence for the subjects/courses of **Computer Science and Technology** at Third Year B Tech Semester V and VI pre-revised Program under the faculty of Engineering and Technology is as follows.

Third Year B. Tech Semester V (Computer Science and Technology)

Sr.No	Third Year B.Tech(Computer Science and Technology) Semester V Pre-revised syllabus	Third Year B.Tech(Computer Science and Technology) Semester V Revised syllabus	Remark
1.	Computer Algorithms	Computer Algorithm	No change in the subject content
2.	System Programming	System Programming	No change in the subject content
3.	Operating System -I	Operating System-I	No change in the subject content
4.	Software Engineering	Software Engineering	No change in the subject content
5.	Wireless Network	Computer Graphics and Multimedia Techniques	
6.	Laboratory –I System Programming	System Programming Lab	No change in the subject content
7.	Laboratory –II Computer Algorithms	Computer Graphics and Multimedia Techniques Lab	
8.	Laboratory –III Seminar-I	Seminar	No change in the subject content
9.	Laboratory –IV Java Programming	Java Programming Lab	No change in the subject content
10.	Audit Course –II Research Methodology	Research Methodology	No change in Audit Course

Third Year B. Tech Semester VI (Computer Science and Technology)

Sr.No	Third Year B Tech(Computer Science and Technology) Semester VI Pre-revised syllabus	Third Year B.Tech(Computer Science and Technology Semester VI Revised syllabus	Remark
1.	Compiler Construction	Compiler Construction	No change in the subject content
2.	Operating System- II	Operating System-II	No change in the subject content
3.	Object Oriented Modeling and Design	Object Oriented Modeling and Design	No change in the subject content
4.	Database Engineering	Database Engineering	No change in the subject content
5.	Information Technology	Engineering Economics	
6.	Laboratory –I Object Oriented Modeling and Design	Object Oriented Modeling and Design Lab	No change in the subject content
7.	Laboratory –II Advanced Programming	Advanced Programming Lab	Change in the subject content
8.	Laboratory –III Database Lab	Database Engineering Lab	No change in the subject content
9.	Laboratory –IV Mini Project	Mini Project	No change in the subject content
10.	Audit Course –III Presentation and communication Techniques	Introduction to Foreign Language	

Audit course have not been assigned any credits. The students will be evaluated for these courses by the concerned course in charge. There will be grade conferred to the student. The grade will be based on conversion of marks obtained out of 50. (Obtaining passing grade is essential). Please refer to chart in the detail examination scheme. The chart shows the marks range and the respective grade.