

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI



3rd to 8th Semester BE – Computer Science and Engineering

Scheme of Teaching and Examinations

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

(Effective from the academic year 2018 – 19)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI													
B.E. in Computer Science and Engineering													
Scheme of Teaching and Examinations 2022													
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)													
(Effective from the academic year 2023-24)													
III SEMESTER													
Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical / Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC/BS C	BCS301	Mathematics for Computer Science	TD: Maths PSB: Maths/CS	3	2	0		03	50	50	100	4
2	IPCC	BCS302	Digital Design & Computer Organization	TD: CS PSB : CS	3	0	2		03	50	50	100	4
3	IPCC	BCS303	Operating Systems	TD: CS PSB : CS	3	0	2		03	50	50	100	4
4	PCC	BCS304	Data Structures and Applications	TD: CS PSB : CS	3	0	0		03	50	50	100	3
5	PCCL	BCSL305	Data Structures Lab	TD: CS PSB : CS	0	0	2		03	50	50	100	1
6	ESC	BCS306x	ESC/ETC/PLC	TD: CS PSB : CS	2	0	2		03	50	50	100	3
7	UHV	BSCK307	Social Connect and Responsibility	Any Department	0	0	2		01	100	---	100	1
8	AEC/ SEC	BCS358x	Ability Enhancement Course/Skill Enhancement Course - III	TD: Concerned department PSB:CS	If the course is a Theory				01	50	50	100	1
					1	0	0						
					If a course is a laboratory				02				
					0	0	2						
9	MC	BNSK359	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		BPEK359	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		BYOK359	Yoga	Yoga Teacher									
Total									550	350	900	21	

PCC: Professional Core Course, **PCCL:** Professional Core Course laboratory, **UHV:** Universal Human Value Course, **MC:** Mandatory Course (Non-credit), **AEC:** Ability Enhancement Course, **SEC:** Skill Enhancement Course, **L:** Lecture, **T:** Tutorial, **P:** Practical **S= SDA:** Skill Development Activity, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation. **K:** This letter in the course code indicates common to all the stream of engineering. **ESC:** Engineering Science Course, **ETC:** Emerging Technology Course, **PLC:** Programming Language Course

Engineering Science Course (ESC/ETC/PLC) (Note- Student should opt for the course which should not be similar to the course opted in 1st Year)

BCS306A	Object Oriented Programming with Java		
BCS306B	Object Oriented Programming with C++		

Ability Enhancement Course – III

BCS358A	Data analytics with Excel	BCS358C	Project Management with Git
BCS358B	R Programming	BCS358D	Data Visualization with Python

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 may please be referred.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

VARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI													
B.E. in Computer Science and Engineering													
Scheme of Teaching and Examinations 2022													
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(Effective from the academic year 2023-24)													
IV SEMESTER													
Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical / Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC/BS C	BCS401	Analysis & Design of Algorithms	TD: CS PSB : CS	3	0	0		03	50	50	100	3
2	IPCC	BCS402	Microcontrollers	TD: CS PSB : CS	3	0	2		03	50	50	100	4
3	IPCC	BCS403	Database Management Systems	TD: CS PSB : CS	3	0	2		03	50	50	100	4
4	PCCL	BCSL404	Analysis & Design of Algorithms Lab	TD: CS PSB : CS	0	0	2		03	50	50	100	1
5	ESC	BCS405x	ESC/ETC/PLC	TD: CS/Maths PSB : CS/Maths	2	2	0		03	50	50	100	3
6	AEC/ SEC	BCS456x	Ability Enhancement Course/Skill Enhancement Course- IV	TD: Concerned department PSB:CS	If the course is Theory				01	50	50	100	1
					1	0	0						
					If the course is a lab				02				
					0	0	2						
4	BSC	BBOK407	Biology For Engineers	TD / PSB: BT, CHE,	2	0	0		03	50	50	100	2
7	UHV	BUHK408	Universal human values course	Any Department	1	0	0		01	50	50	100	1
9	MC	BNSK459	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		BPEK459	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		BYOK459	Yoga	Yoga Teacher									

		Total	500	400	900	19
<p>PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical S= SDA: Skill Development Activity, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K :This letter in the course code indicates common to all the stream of engineering.</p>						
Ability Enhancement Course / Skill Enhancement Course – IV						
BCS456A	Green IT and Sustainability	BCS456C	UI/UX (Lab)			
BCS456B	Capacity Planning for IT	BCS456D	Technical writing using LATEX (Lab)			
Engineering Science Course (ESC/ETC/PLC)						
BCS405A	Discrete Mathematical Structures	BCS405C	Optimization Technique			
BCS405B	Graph Theory	BCS405D	Linear Algebra			
<p>Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23</p> <p>National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses is mandatory for the award of degree.</p>						

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
B.E. in Computer Science and Engineering
B.E. in the title of the program
Scheme of Teaching and Examinations 2022
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 (Effective from the academic year 2023-24)

V SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorials	Practical / Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	HSMS	BCS501	Software Engineering & Project Management (This course must be pertaining to economics and management of the concerned degree program. The course syllabus should have both economics and management topics and the course title should bear the word Management.)	TD: CS PSB : CS	3	0	0		03	50	50	100	3
2	IPCC	BCS502	Computer Networks	TD: CS PSB : CS	3	0	2		03	50	50	100	4
3	PCC	BCS503	Theory of Computation	TD: CS PSB : CS	3	2	0		03	50	50	100	4
4	PCCL	BCSL504	Web Technology Lab	TD: CS PSB : CS	0	0	2		03	50	50	100	1
5	PEC	BCS515x	Professional Elective Course	TD: CS PSB : CS	3	0	0		03	50	50	100	3
6	PROJ	BCS586	Mini Project	TD: CS PSB : CS	0	0	4		03	100		100	2
7	AEC	BRMK557	Research Methodology and IPR	TD: HSM PSB : HSM	2	2	0		02	50	50	100	3
8	MC	BESK508	Environmental Studies	TD: HSM PSB : HSM	2	0	0		02	50	50	100	2
9	MC	BNSK559	National Service Scheme (NSS)	NSS coordinator	0	0	2			100		100	0
		BPEK559	Physical Education (PE) (Sports and Athletics)	Physical Education Director									

	BYOK559	Yoga	Yoga Teacher											
										Total	500	300	800	22
Professional Elective Course														
BCS515A	Computer Graphics			BCS515C	Unix System Programming									
BCS515B	Artificial Intelligence			BCS515D	Distributed Systems									
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<p>Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23</p>														
<p>National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.</p>														
<p>Mini-project work: Mini Project is a laboratory-oriented/hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.</p>														
<p>CIE procedure for Mini-project:</p>														
<p>(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batches mates.</p>														
<p>(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project. The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.</p>														
<p>No SEE component for Mini-Project.</p>														

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

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VI SEMESTER													
Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	T u o r i a l	Prac t i c a l / Dra w i n g	SDA	Dur at i o n i n h o u r s	CIE Mar ks	SEE Mar ks	Total Mar ks	
1	IPCC	BCS601	Cloud Computing (Open Stack /Google)	TD: CS PSB : CS	3	0	2		03	50	50	100	4
2	PCC	BCS602	Machine Learning	TD: CS PSB : CS	4	0	0		03	50	50	100	4
3	PEC	BCS613x	Professional Elective Course	TD: CS PSB : CS	3	0	0		03	50	50	100	3
4	OEC	BCS654x	Open Elective Course	TD: CS PSB : CS	3	0	0		03	50	50	100	3
5	PROJ	BCS685	Project Phase I	TD: CS PSB : CS	0	0	4		03	100	--	100	2
6	PCCL	BCSL606	Machine Learning lab	TD: CS PSB : CS	0	0	2		03	50	50	100	1
7	AEC/SD C	BCS657x	Ability Enhancement Course/Skill Development Course V	TD and PSB: Concerned department	If the course is offered as a Theory				01	50	50	100	1
					1	0	0						
					If course is offered as a practical								
					0	0	2						
8	MC	BNSK658	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		BPEK658	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		BYOK658	Yoga	Yoga Teacher									
Total									500	300	800	18	
Professional Elective Course													
BCS613A		Blockchain Technology			BCS613C		Compiler Design						
BCS613B		Computer Vision			BCS613D		Advanced Java						

Open Elective Course			
BCS654A	Introduction to Data Structures	BCS654C	Mobile Application Development
BCS654B	Fundamentals of Operating Systems	BCS654D	Introduction to AI
Ability Enhancement Course / Skill Enhancement Course-V			
BCS657A	Progressive App Development	BCS657C	Agile
BCS657B	Tosca – Automated Software Testing	BCS657D	Devops
<p>PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical S= SDA: Skill Development Activity, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K : The letter in the course code indicates common to all the stream of engineering. PROJ: Project /Mini Project. PEC: Professional Elective Course. PROJ: Project Phase -I, OEC: Open Elective Course</p>			
<p>Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23</p>			
<p>National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.</p>			
<p>Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.</p>			
<p>Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.</p>			
<p>Project Phase-I : Students have to discuss with the mentor /guide and with their helphe/she has to complete the literature survey and prepare the report and finally</p>			

define the problem statement for the project work.

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VI SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical / Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	BCS701	Internet of Things	TD: CS PSB : CS	3	0	2		03	50	50	100	4
2	IPCC	BCS702	Parallel Computing	TD: CS PSB : CS	3	0	2		03	50	50	100	4
3	PCC	BCS703	Cryptography & Network Security	TD: CS PSB : CS	4	0	0		03	50	50	100	4
4	PEC	BCS714x	Professional Elective Course	TD: CS PSB : CS	3	0	0		03	50	50	100	3
5	OEC	BCS755x	Open Elective Course	TD: CS PSB : CS	3	0	0		01	50	50	100	3
6	PROJ	BCS786	Major Project Phase-II	TD: CS PSB : CS	0	0	12		03	100	100	200	6
									400	300	700	24	

Professional Elective Course

BCS714A	Deep Learning	BCS714C	Enterprise Data Warehousing
BCS714B	Natural Language Processing	BCS714D	Big Data Analytics

Open Elective Course

BCS755A	Introduction to DBMS	BCS755C	Software Engineering
BCS755B	Introduction to Algorithms	BCS755D	

PCC: Professional Core Course, **PCCL:** Professional Core Course laboratory, **PEC:** Professional Elective Course, **OEC:** Open Elective Course **PR:** Project Work, **L:** Lecture, **T:** Tutorial, **P:** Practical **S= SDA:** Skill Development Activity, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation. **TD-** Teaching Department, **PSB:** Paper Setting department, **OEC:** Open Elective Course, **PEC:** Professional Elective Course. **PROJ:** Project work

Note: VII and VIII semesters of IV years of the program

(1) Institutions can swap the VII and VIII Semester Schemes of Teaching and Examinations to accommodate research internships/ industry internships after the VI semester.

(2) Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether the VII or VIII semesters is completed during the beginning of the IV year or the later part of IV years of the program.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

PROJECT WORK (21CSP75): The objective of the Project work is

- (i)** To encourage independent learning and the innovative attitude of the students.
- (ii)** To develop interactive attitude, communication skills, organization, time management, and presentation skills.
- (iii)** To impart flexibility and adaptability.
- (iv)** To inspire team working.
- (v)** To expand intellectual capacity, credibility, judgment and intuition.
- (vi)** To adhere to punctuality, setting and meeting deadlines.
- (vii)** To install responsibilities to oneself and others.
- (viii)** To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:

(1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

(2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external

guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.

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VIII SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination			Credits	
					Theory Lecture	Tutorial	Practical / Drawing	SDA	Duration in hours	CIE Marks	SEE Marks		Total Marks
					L	T	P	S					
1	PEC	BCS801x	Professional Elective (Online Courses) Only through NPTEL	PSB : CS	3	0	0		03	50	50	100	3
2	OEC	BCS802x	Open Elective (Online Courses) Only through NPTEL	PSB : CS	3	0	0		01	50	50	100	3
3	INT	BCS803	Internship (Industry/Research) (14 - 20 weeks)		0	0	12		03	100	100	200	10
										200	200	400	16

Professional Elective Course (Online courses)

BCS801A	BOS will publish courses based on the availability	BCS801C
BCS801B		BCS801D

Open Elective Courses (Online Courses)

BCS802A	BOS will publish courses based on the availability	BCS802C
BCS802B		BCS802D

L: Lecture, **T:** Tutorial, **P:** Practical **S= SDA:** Skill Development Activity, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation. **TD-** Teaching Department, **PSB:** Paper Setting department, **OEC:** Open Elective Course, **PEC:** Professional Elective Course. **PROJ:** Project work, **INT:** Industry Internship / Research Internship / Rural Internship

Note: VII and VIII semesters of IV years of the program

Swapping Facility

- Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate **research internships/ industry internships/Rural Internship** after the VI semester.
- Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether VII or VIII semester is completed during the beginning of IV year or later part of IV year of the program.
- **Note: For BCS801x and BCS802x courses BOS will announce the list of courses in 6th , 7th & 8th Sem . Students can register in any of the semesters to earn the credits in 8th Sem.**

Elucidation:

At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester **Research Internship /Industrial Internship / Rural Internship** shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Research Internship or Industrial Internship or Rural Internship.

Research/Industrial /Rural Internship shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

The mandatory Research internship /Industry internship / Rural Internship is for 14 to 20 weeks. The internship shall be considered as a head of passing and shall be considered for the award of a degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements.

Research internship: A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research.

Industry internship: Is an extended period of work experience undertaken by students to supplement their degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints.

Rural Internship: Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.

The faculty coordinator or mentor has to monitor the student's internship progress and interact with them to guide for the successful completion of the internship.

The students are permitted to carry out the internship anywhere in India or abroad. University shall not bear any expenses incurred in respect of the internship.

With the consent of the internal guide and Principal of the Institution, students shall be allowed to carry out the internship at their hometown (**within or outside the state or abroad**), provided favorable facilities are available for the internship and the student remains regularly in contact with the internal guide. **University shall not bear any cost involved in carrying out the internship by students.** However, students can receive any financial assistance extended by the organization.

Professional Elective /Open Elective Course:These are ONLINE courses suggested by the respective Board of Studies. Details of these courses shall be made available for students on the VTU web portal.

Please note: If any clarifications / suggestions please email to sbhvtuso@yahoo.com

Visvesvaraya Technological University, Belagavi													
Scheme of Teaching and examinations-2022													
Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)													
(Effective from the academic year 2022-23)													
I Semester (CSE Stream) (Physics Group)													
Sl. No	Course and course code		Course title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	BMATS101	Mathematics-I for CSE Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BPHYS102	Applied Physics for CSE stream	Physics	2	2	2	0	03	50	50	100	04
3	ESC	BPOPS103	Principles of Programming Using C	CSE	2	0	2	0	03	50	50	100	03
4	ESC-I	BESCK104x	Engineering Science Course-I	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	BETCK105x	Emerging Technology Course-I	Any Dept	3	0	0	0	03	50	50	100	03
	OR												
	PLC-I	BPLCK105x	Programming Languages Course-I		2	0	2	0	03				
6	AEC	BENGG106	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BPWSK106	Professional Writing Skills in English										
7	HSMC	BKSKK107 BKBKK107	Sanskritika Kannada/ Balake Kannada	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BICOK107	Indian Constitution										
8	AEC/SDC	BIDTK158	Innovation and Design Thinking	Any Dept	1	0	0	0	02	50	50	100	01
		OR											
		BSFHK158	Scientific Foundations of Health						01				
TOTAL										400	400	800	20

SDA-Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses, ETC-

Emerging Technology Course, AEC - Ability Enhancement Course, HSMS -Humanity and Social Science and management Course, SDC - Skill Development Course, CIE -Continuous Internal Evaluation, SEE - Semester End Examination, IC – Integrated Course (Theory Course Integrated with Practical Course)	
<p>Credit Definition: 1-hour Lecture (L) per week=1Credit 2-hoursTutorial(T) per week=1Credit 2-hours Practical / Drawing (P) per week=1Credit 2-hous Skill Development Actives (SDA) per week = 1 Credit</p>	<p>04-Credits courses are to be designed for 50 hours of Teaching-Learning Session 04-Credits (IC) are to be designed for 40 hours’ theory and 12-14 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions</p>
<p>Student’s Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students’ character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer the ANNEXURE-I of Induction Programs notification of the University published at the beginning of the 1st semester.</p>	
<p>AICTE Activity Points to be earned by students admitted to BE/ B.Tech., / B. Plan day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student’s eighth semester Grade Card. The activities can be spread over the years, any time during the semester weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hours’ requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.</p>	
<p>*- BMATS101 Shall have the 03 hours of theory examination (SEE), however, practical sessions question shall be included in the theory question papers. ** The mathematics subject should be taught by a single faculty member per division, with no sharing of the course(subject)module-wise by different faculty members.</p> <p>#- BPHYS102SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination</p> <p>ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature then, of course, required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0).</p> <p>All 01 Credit- courses shall have the SEE of 01 hours duration and the pattern of the question paper shall be MCQ</p>	

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	Title	L	T	P	Code	Title	L	T	P
BESCK104A	Introduction to Civil Engineering	3	0	0	BETCK105A	Smart Materials and Systems	3	0	0
BESCK104B	Introduction to Electrical Engineering	3	0	0	BETCK105B	Green Buildings	3	0	0
BESCK104C	Introduction to Electronics Communication	3	0	0	BETCK105C	Introduction to Nano Technology	3	0	0
BESCK104D	Introduction to Mechanical Engineering	3	0	0	BETCK105D	Introduction to Sustainable Engineering	3	0	0
BESCK104E	Introduction to C Programming	2	0	2	BETCK105E	Renewable Energy Sources	3	0	0
					BETCK105F	Waste Management	3	0	0
					BETCK105G	Emerging Applications of Biosensors	3	0	0
					BETCK105H	Introduction to Internet of Things (IOT)	3	0	0
					BETCK105I	Introduction to Cyber Security	3	0	0
					BETCK105J	Introduction to Embedded System	3	0	0
(PLC-I) Programming Language Courses-I									
Code	Title	L	T	P					
BPLCK105A	Introduction to Web Programming	2	0	2					
BPLCK105B	Introduction to Python Programming	2	0	2					
BPLCK105C	Basics of JAVA programming	2	0	2					
BPLCK105D	Introduction to C++ Programming	2	0	2					
The course 22ESC145/245, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by ANY DEPARTMENT									

- The student has to select one course from the ESC-I group.
- CSE/ISE and allied branches Students shall opt for any one of the courses from the ESC-I group **except**, BESCK104E-**Introduction to C Programming**
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester
- The students must select one course from either ETC-I or PLC-I group.
- If students study the subject from ETC-I in 1st semester he/she has to select the course from PLC-II in the 2nd semester and vice-versa

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

Visvesvaraya Technological University, Belagavi Scheme of Teaching and Examinations-2022 Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-23)													
II Semester (CSE Stream)			(For students attended 1 st semester under Physics Group)										
Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	BMATS201	Mathematics-II for CSE Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BCHES202	Applied Chemistry for CSE Stream	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	BCEDK203	Computer-Aided Engineering Drawing	Civil/Mech Engg dept	2	0	2	0	03	50	50	100	03
4	ESC-II	BESCK204x	Engineering Science Course-II	Respective Engg. Dept	3	0	0	0	03	50	50	100	03
5	PLC-II	BETCK205x	Programming Language Course-II	Any Dept	2	00	2	0	03	50	50	100	03
	OR												
	ETC-II	BPLCK205x	Emerging Technology Course-II		3	0	0	0	03				
6	AEC	BPWSK206	Professional Writing Skills in English	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BENCK206	Communicative English										
7	HSMS	BICOK207	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BKSKK207/ BKBKK207	Sanskrutika Kannada/ Balake Kannada										
8	HSMS	BSFHK258	Scientific Foundations of Health	Any Dept	1	0	0	0	01	50	50	100	01
		OR											
		KIDTK258	Innovation and Design Thinking						01				
TOTAL										400	400	800	20

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**-Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

*- **BMATS201** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers. ** **The mathematics subject should be taught by a single faculty member per division, with no sharing of the course(subject)module-wise by different faculty members.**

#- **BCHES202**- SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature the of course required experimental learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0),

All 01 Credit- courses shall have the SEE of 01 hours duration and the pattern of the question paper shall be MCQ

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

(ESC-II) Engineering Science Courses-II					(ETC-II) Emerging Technology Courses-II				
Code	Title	L	T	P	Code	Title	L	T	P
BESCK204A	Introduction to Civil Engineering	3	0	0	BETCK205A	Smart materials and Systems	3	0	0
BESCK204B	Introduction to Electrical Engineering	3	0	0	BETCK205B	Green Buildings	3	0	0
BESCK204C	Introduction to Electronics Communication	3	0	0	BETCK205C	Introduction to Nano Technology	3	0	0
BESCK204D	Introduction to Mechanical Engineering	3	0	0	BETCK205D	Introduction to Sustainable Engineering	3	0	0
BESCK204E	Introduction to C Programming	2	0	2	BETCK205E	Renewable Energy Sources	3	0	0
					BETCK205F	Waste Management	3	0	0
					BETCK205G	Emerging Applications of Biosensors	3	0	0
					BETCK205H	Introduction to Internet of Things(IoT)	3	0	0
					BETCK205I	Introduction to Cyber Security	3	0	0
					BETCK205J	Introduction to Embedded System	3	0	0
(PLC-II) Programming Language Courses-II									
Code	Title	L	T	P					
BPLCK205A	Introduction to Web Programming	2	0	2					
BPLCK205B	Introduction to Python Programming	2	0	2					
BPLCK205C	Basics of JAVA programming	2	0	2					
BPLCK205D	Introduction to C++ Programming	2	0	2					
The course BESCK204E, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by ANY DEPARTMENT									

- The student has to select one course from the ESC-II group.
- CSE/ISE and allied branches Students shall opt for any one of the courses from the ESC-II group **except**, BESCK245E-**Introduction to C Programming**
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester
- The students must select one course from either ETC-II or PLC-II group.
- If students study the subject from ETC-I in 1st semester he/she has to select the course from PLC-II in the 2nd semester and vice-versa

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

Visvesvaraya Technological University, Belagavi													
Scheme of Teaching and Examinations-2022													
Outcome-Based Education(OBE) and Choice Based Credit System(CBCS)													
(Effective from the academic year 2022-23)													
I Semester (CSE Stream)					(For Chemistry Group)								
Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	BMATS101	Mathematics-I for CSE Stream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BCHES102	Applied Chemistry for CSE Stream	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	BCEDK103	Computer-Aided Engineering Drawing	Civil/Mech Engg dept	2	0	2	0	03	50	50	100	03
4	ESC-I	BESCK104x	Engineering Science Course-I	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	ETC-I	BETCK105x	Emerging Technology Course-I	Any Dept	3	0	0	0	03	50	50	100	03
	OR												
	PLC-I	BPLCK105x	Programming Language Course-I		2	0	2	0	03				
6	AEC	BPWSK106	Professional Writing Skills in English	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BENGK106	Communicative English										
7	HSMS	BICOK107	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BKSKK107/ BKBKK107	Sanskrutika Kannada/ Balake Kannada										
8	HSMS	BSFHK158	Scientific Foundations of Health	Any Dept	1	0	0	0	01	50	50	100	01
		OR											
		BIDTK158	Innovation and Design Thinking						02				
TOTAL										400	400	800	20

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

<p>SDA-Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses, ETC- Emerging Technology Course, AEC- Ability Enhancement Course, HSMS-Humanity and Social Science and management Course, SDC- Skill Development Course, CIE -Continuous Internal Evaluation, SEE- Semester End Examination, IC – Integrated Course (Theory Course Integrated with Practical Course)</p>	
<p>*- BMATS101 Shall have the 03 hours of theory examination (SEE), however, practical sessions question shall be included in the theory question papers. ** The mathematics subject should be taught by a single faculty member per division, with no sharing of the course(subject)module-wise by different faculty members.</p> <p>#- BCHES102- SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination</p> <p>ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature the of course required experimental learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0),</p> <p>All 01 Credit- courses shall have the SEE of 01 hours duration and the pattern of the question paper shall be MCQ</p>	
<p>Credit Definition: 1-hour Lecture (L) per week=1Credit 2-hours Tutorial(T) per week=1Credit 2-hours Practical / Drawing (P) per week=1Credit 2-hous Skill Development Actives (SDA) per week = 1 Credit</p>	<p>04-Credits courses are to be designed for 50 hours of Teaching-Learning Session 04-Credits (IC) are to be designed for 40 hours’ theory and 12-14 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions</p>
<p>Student’s Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students’ character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer the ANNEXURE-I of Induction Programs notification of the University published at the beginning of the 1st semester.</p>	
<p>AICTE Activity Points to be earned by students admitted to BE/ B.Tech., / B. Plan day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student’s eighth semester Grade Card. The activities can be spread over the years, any time during the semester weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hours’ requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.</p>	

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	Title	L	T	P	Code	Title	L	T	P
BESCK104A	Introduction to Civil Engineering	3	0	0	BETCK105A	Smart Materials and Systems	3	0	0
BESCK104B	Introduction to Electrical Engineering	3	0	0	BETCK105B	Green Buildings	3	0	0
BESCK104C	Introduction to Electronics Communication	3	0	0	BETCK105C	Introduction to Nano Technology	3	0	0
BESCK104D	Introduction to Mechanical Engineering	3	0	0	BETCK105D	Introduction to Sustainable Engineering	3	0	0
BESCK104E	Introduction to C Programming	2	0	2	BETCK105E	Renewable Energy Sources	3	0	0
					BETCK105F	Waste Management	3	0	0
					BETCK105G	Emerging Applications of Biosensors	3	0	0
					BETCK105H	Introduction to Internet of Things (IOT)	3	0	0
					BETCK105I	Introduction to Cyber Security	3	0	0
					BETCK105J	Introduction to Embedded System	3	0	0
(PLC-I) Programming Language Courses-I									
Code	Title	L	T	P					
BPLCK105A	Introduction to Web Programming	2	0	2					
BPLCK105B	Introduction to Python Programming	2	0	2					
BPLCK105C	Basics of JAVA programming	2	0	2					
BPLCK105D	Introduction to C++ Programming	2	0	2					
The course BESCK104E, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by ANY DEPARTMENT									

- The student has to select one course from the ESC-I group.
- CSE/ISE & allied branch students shall opt for any one of the courses from the ESC-I group **except**, BESCK145E-**Introduction to C Programming**
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester
- The students must select one course from either ETC-I or PLC-I group.
- If students study the subject from ETC-I in 1st semester he/she has to select the course from PLC-II in the 2nd semester and vice-versa

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

Visvesvaraya Technological University, Belagavi													
Scheme of Teaching and Examinations-2022													
Outcome-Based Education(OBE)andChoiceBasedCreditSystem(CBCS)													
(Effectivefromtheacademicyear 2022-23)													
II Semester (CSE Streams)					(For students who attended 1 st semester under Chemistry Group)								
Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination			Credits	
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks		Total Marks
					L	T	P	S					
1	*ASC(IC)	BMATS201	Mathematics-II for CSEStream	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BPHYS202	Applied Physics for CSE Stream	Physics	2	2	2	0	03	50	50	100	04
3	ESC	BPOPS203	Principles of Programming Using C	CSE	2	0	2	0	03	50	50	100	03
4	ESC-II	BESCK204x	Engineering Science Course-II	Respective Engg dept	3	0	0	0	03	50	50	100	03
5	ETC-II	BPLCK205x	Programming Language Course-II	Any Dept	2	00	2	0	03	50	50	100	03
	OR												
	PLC-II	BETCK205x	Emerging Technology Course-II		3	0	0	0	03				
6	AEC	BENGK206	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BPWSK206	Professional Writing Skills in English										
7	HSMC	BKSKK207 BKBKK207	Sanskrutika Kannada/ Balake Kannada	Humanities	1	0	0	0	01	50	50	100	01
		OR											
		BICOK207	Indian Constitution										
8	AEC/SDC	BIDTK258	Innovation and Design Thinking	Any Dept	1	0	0	0	01	50	50	100	01
		OR											
		BSFHK258	Scientific Foundations of Health		1	0	0	0	01				
TOTAL										400	400	800	20

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**-Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

*- **BMATS201** shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers. ** **The mathematics subject should be taught by a single faculty member per division, with no sharing of the course(subject)module-wise by different faculty members.**

#- **BPHYS202**SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or **if the nature of the of course required experimental learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0).All 01 Credit-** courses shall have the SEE of 01 hours duration and the pattern of the question paper shall be MCQ

(ESC-II) Engineering Science Courses-II					(ETC-II) Emerging Technology Courses-II				
Code	Title	L	T	P	Code	Title	L	T	P
BESCK204A	Introduction to Civil Engineering	3	0	0	BETCK205A	Smart materials and Systems	3	0	0
BESCK204B	Introduction to Electrical Engineering	3	0	0	BETCK205B	Green Buildings	3	0	0
BESCK204C	Introduction to Electronics Communication	3	0	0	BETCK205C	Introduction to Nano Technology	3	0	0
BESCK204D	Introduction to Mechanical Engineering	3	0	0	BETCK205D	Introduction to Sustainable Engineering	3	0	0
BESCK204E	Introduction to C Programming	2	0	2	BETCK205E	Renewable Energy Sources	3	0	0
					BETCK205F	Waste Management	3	0	0
					BETCK205G	Emerging Applications of Biosensors	3	0	0
					BETCK205H	Introduction to Internet of Things (IoT)	3	0	0
					BETCK205I	Introduction to Cyber Security	3	0	0
					BETCK205J	Introduction to Embedded System	3	0	0
(PLC-II) Programming Language Courses-II									
Code	Title	L	T	P					
BPLCK205A	Introduction to Web Programming	2	0	2					
BPLCK205B	Introduction to Python Programming	2	0	2					
BPLCK205C	Basics of JAVA programming	2	0	2					
BPLCK205D	Introduction to C++ Programming	2	0	2					
The course BESCK204E, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by ANY DEPARTMENT									

29052023/V10 scheme for Computer Science and Engineering and allied branches (CSE/ISE and BT all allied branches of CSE)

- The student has to select one course from the ESC-II group.
- Civil Engineering Students shall opt for any one of the courses from the ESC-II group **except, BESCK204E-Introduction to C Programming**
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester
- The students must select one course from either ETC-II or PLC-II group.
- If students study the subject from ETC-I in 1st semester he/she has to select the course from PLC-II in the 2nd semester and vice-versa

Mathematics for Computer Science		Semester	3
Course Code	BCS301	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 20 Hours Tutorial	Total Marks	100
Credits	04	Exam Hours	3
Examination type (SEE)	Theory		
<p>Course objectives: This course will enable the students to:</p> <ol style="list-style-type: none"> 1. To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in Computer Science Engineering and social life situations. 2. To Provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses. 3. To Determine whether an input has a statistically significant effect on the system's response through ANOVA testing. 			
<p>Teaching-Learning Process Pedagogy (General Instructions): Teachers can use the following strategies to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills. 2. State the need for Mathematics with Engineering Studies and Provide real-life examples. 3. Support and guide the students for self-study. 4. You will assign homework, grading assignments and quizzes, and documenting students' progress. 5. Encourage the students to group learning to improve their creative and analytical skills. 6. Show short related video lectures in the following ways: <ul style="list-style-type: none"> • As an introduction to new topics (pre-lecture activity). • As a revision of topics (post-lecture activity). • As additional examples (post-lecture activity). • As an additional material of challenging topics (pre-and post-lecture activity). • As a model solution of some exercises (post-lecture activity). 			
Module-1: Probability Distributions			
<p>Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples. Exponential distribution. (12 Hours) (RBT Levels: L1, L2 and L3)</p>			
Pedagogy	Chalk and Board, Problem-based learning		
Module-2: Joint probability distribution & Markov Chain			

	<p>Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance and correlation.</p> <p>Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states. (12 Hours) (RBT Levels: L1, L2 and L3)</p>
Pedagogy	Chalk and Board, Problem-based learning
Module-3: Statistical Inference 1	
	<p>Introduction, sampling distribution, standard error, testing of hypothesis, levels of significance, test of significances, confidence limits, simple sampling of attributes, test of significance for large samples, comparison of large samples. (12 Hours) (RBT Levels: L1, L2 and L3)</p>
Pedagogy	Chalk and Board, Problem-based learning
Module-4: Statistical Inference 2	
	<p>Sampling variables, central limit theorem and confidences limit for unknown mean. Test of Significance for means of two small samples, students 't' distribution, Chi-square distribution as a test of goodness of fit. F-Distribution. (12 Hours) (RBT Levels: L1, L2 and L3)</p>
Pedagogy	Chalk and Board, Problem-based learning
Module-5: Design of Experiments & ANOVA	
	<p>Principles of experimentation in design, Analysis of completely randomized design, randomized block design. The ANOVA Technique, Basic Principle of ANOVA, One-way ANOVA, Two-way ANOVA, Latin-square Design, and Analysis of Co-Variance. (12 Hours) (RBT Levels: L1, L2 and L3)</p>
Pedagogy	Chalk and Board, Problem-based learning
<p>Course outcome (Course Skill Set) At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Explain the basic concepts of probability, random variables, probability distribution 2. Apply suitable probability distribution models for the given scenario. 3. Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem 4. Use statistical methodology and tools in the engineering problem-solving process. 5. Compute the confidence intervals for the mean of the population. 6. Apply the ANOVA test related to engineering problems. 	
<p>Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p>Continuous Internal Evaluation:</p> <ul style="list-style-type: none"> ● For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment 	

Test component, there are 25 marks.

- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Textbooks:

1. **Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye** "Probability & Statistics for Engineers & Scientists", Pearson Education, 9th edition, 2017.
2. **Peter Bruce, Andrew Bruce & Peter Gedeck** "Practical Statistics for Data Scientists" O'Reilly Media, Inc., 2nd edition **2020**.

Reference Books: (Name of the author/Title of the Book/ Name of the publisher/Edition and Year)

1. **Erwin Kreyszig**, "Advanced Engineering Mathematics", John Wiley & Sons, 9th Edition, 2006.
2. **B. S. Grewal** "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
3. **G Haribaskaran** "Probability, Queuing Theory & Reliability Engineering", Laxmi Publication, Latest Edition, 2006
4. **Irwin Miller & Marylees Miller**, John E. Freund's "Mathematical Statistics with Applications" Pearson. Dorling Kindersley Pvt. Ltd. India, 8th edition, 2014.
5. **S C Gupta and V K Kapoor**, "Fundamentals of Mathematical Statistics", S Chand and Company, Latest edition.
6. **Robert V. Hogg, Joseph W. McKean & Allen T. Craig**. "Introduction to Mathematical Statistics", Pearson Education 7th edition, 2013.
7. **Jim Pitman**. Probability, Springer-Verlag, 1993.
8. **Sheldon M. Ross**, "Introduction to Probability Models" 11th edition. Elsevier, 2014.
9. **A. M. Yaglom and I. M. Yaglom**, "Probability and Information". D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi, 1983.
10. **P. G. Hoel, S. C. Port and C. J. Stone**, "Introduction to Probability Theory", Universal Book Stall, (Reprint), 2003.
11. **S. Ross**, "A First Course in Probability", Pearson Education India, 6th Ed., 2002.
12. **W. Feller**, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 3rd

Ed., 1968.

13. **N.P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

14. **Veerarajan T**, Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010

Web links and Video Lectures (e-Resources):

<http://nptel.ac.in/courses.php?disciplineID=111>

[http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))

<http://academicearth.org/>

<http://www.bookstreet.in>.

[VTU EDUSAT PROGRAMME – 20](#)

VTU e-Shikshana Program

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Programming Assignment
- Seminars

Digital Design and Computer Organization		Semester	3
Course Code	BCS302	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 20 Hours of Practicals	Total Marks	100
Credits	04	Exam Hours	3
Examination nature (SEE)	Theory		
Course objectives:			
<ul style="list-style-type: none"> ● To demonstrate the functionalities of binary logic system ● To explain the working of combinational and sequential logic system ● To realize the basic structure of computer system ● To illustrate the working of I/O operations and processing unit 			
Teaching-Learning Process (General Instructions)			
These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.			
<ol style="list-style-type: none"> 1. Chalk and Talk 2. Live Demo with experiments 3. Power point presentation 			
MODULE-1		8 Hr	
Introduction to Digital Design: Binary Logic, Basic Theorems And Properties Of Boolean Algebra, Boolean Functions, Digital Logic Gates, Introduction, The Map Method, Four-Variable Map, Don't-Care Conditions, NAND and NOR Implementation, Other Hardware Description Language – Verilog Model of a simple circuit.			
Text book 1: 1.9, 2.4, 2.5, 2.8, 3.1, 3.2, 3.3, 3.5, 3.6, 3.9			
MODULE-2		8 Hr	
Combinational Logic: Introduction, Combinational Circuits, Design Procedure, Binary Adder- Subtractor, Decoders, Encoders, Multiplexers. HDL Models of Combinational Circuits – Adder, Multiplexer, Encoder.			
Sequential Logic: Introduction, Sequential Circuits, Storage Elements: Latches, Flip-Flops.			
Text book 1: 4.1, 4.2, 4.4, 4.5, 4.9, 4.10, 4.11, 4.12, 5.1, 5.2, 5.3, 5.4.			
MODULE-3		8 Hr	
Basic Structure of Computers: Functional Units, Basic Operational Concepts, Bus structure, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instruction and Instruction sequencing, Addressing Modes.			
Text book 2: 1.2, 1.3, 1.4, 1.6, 2.2, 2.3, 2.4, 2.5			
MODULE-4		8 Hr	
Input/output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access: Bus Arbitration, Speed, size and Cost of memory systems. Cache Memories – Mapping Functions.			
Text book 2: 4.1, 4.2.1, 4.2.2, 4.2.3, 4.4, 5.4, 5.5.1			
MODULE-5		8 Hr	

Basic Processing Unit: Some Fundamental Concepts: Register Transfers, Performing ALU operations, fetching a word from Memory, Storing a word in memory. Execution of a Complete Instruction. **Pipelining:** Basic concepts, Role of Cache memory, Pipeline Performance.

Text book 2: 7.1, 7.2, 8.1

PRACTICAL COMPONENT OF IPCC

Sl.N O	Experiments Simulation packages preferred: Multisim, Modelsim, PSpice or any other relevant
1	Given a 4-variable logic expression, simplify it using appropriate technique and simulate the same using basic gates.
2	Design a 4 bit full adder and subtractor and simulate the same using basic gates.
3	Design Verilog HDL to implement simple circuits using structural, Data flow and Behavioural model.
4	Design Verilog HDL to implement Binary Adder-Subtractor – Half and Full Adder, Half and Full Subtractor.
5	Design Verilog HDL to implement Decimal adder.
6	Design Verilog program to implement Different types of multiplexer like 2:1, 4:1 and 8:1.
7	Design Verilog program to implement types of De-Multiplexer.
8	Design Verilog program for implementing various types of Flip-Flops such as SR, JK and D.

Course outcomes (Course Skill Set):

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

CO1: Apply the K-Map techniques to simplify various Boolean expressions.

CO2: Design different types of combinational and sequential circuits along with Verilog programs.

CO3: Describe the fundamentals of machine instructions, addressing modes and Processor performance.

CO4: Explain the approaches involved in achieving communication between processor and I/O devices.

CO5: Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other

assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. M. Morris Mano & Michael D. Ciletti, Digital Design With an Introduction to Verilog Design, 5e, Pearson Education.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill.

Web links and Video Lectures (e-Resources):

<https://cse11-iiith.vlabs.ac.in/>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Assign the group task to Design the various types of counters and display the output accordingly

Assessment Methods

- Lab Assessment (25 Marks)
- GATE Based Aptitude Test

OPERATING SYSTEMS		Semester	3
Course Code	BCS303	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 20 hours practicals	Total Marks	100
Credits	04	Exam Hours	3
Examination nature (SEE)	Theory		
<p>Course objectives:</p> <ul style="list-style-type: none"> ● To Demonstrate the need for OS and different types of OS ● To discuss suitable techniques for management of different resources ● To demonstrate different APIs/Commands related to processor, memory, storage and file system management. 			
<p>Teaching-Learning Process (General Instructions) Teachers can use the following strategies to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Lecturer methods (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes. 2. Use of Video/Animation to explain functioning of various concepts. 3. Encourage collaborative (Group Learning) Learning in the class. 4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it. 5. Role play for process scheduling. 6. Demonstrate the installation of any one Linux OS on VMware/Virtual Box 			
MODULE-1		8 Hours	
<p>Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments.</p> <p>Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System debugging, Operating System generation; System boot.</p> <p>Textbook 1: Chapter – 1 (1.1-1.12), 2 (2.2-2.11)</p>			
MODULE-2		8 Hours	
<p>Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication</p> <p>Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues.</p> <p>Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling,</p> <p>Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1-4.4), 5 (5.1 -5.5)</p>			
MODULE-3		8 Hours	

<p>Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization;</p> <p>Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.</p> <p>Textbook 1: Chapter – 6 (6.1-6.6), 7 (7.1 -7.7)</p>	
MODULE-4	8 Hours
<p>Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.</p> <p>Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.</p> <p>Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6)</p>	
MODULE-5	8 Hours
<p>File System, Implementation of File System: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.</p> <p>Secondary Storage Structure, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix.</p> <p>Textbook 1: Chapter – 10 (10.1-10.5) ,11 (11.1-11.5),12 (12.1-12.5), 14 (14.1-14.4)</p>	

PRACTICAL COMPONENT OF IPCC *(May cover all / major modules)*

SL.N O	Experiments
1	Develop a c program to implement the Process system calls (fork (), exec(), wait(), create process, terminate process)
2	Simulate the following CPU scheduling algorithms to find turnaround time and waiting time a) FCFS b) SJF c) Round Robin d) Priority.
3	Develop a C program to simulate producer-consumer problem using semaphores.
4	Develop a C program which demonstrates interprocess communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.
5	Develop a C program to simulate Bankers Algorithm for DeadLock Avoidance.
6	Develop a C program to simulate the following contiguous memory allocation Techniques: a) Worst fit b) Best fit c) First fit.
7	Develop a C program to simulate page replacement algorithms: a) FIFO b) LRU
8	Simulate following File Organization Techniques a) Single level directory b) Two level directory
9	Develop a C program to simulate the Linked file allocation strategies.
10	Develop a C program to simulate SCAN disk scheduling algorithm.

Course outcomes (Course Skill Set):

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

CO 1. Explain the structure and functionality of operating system

CO 2. Apply appropriate CPU scheduling algorithms for the given problem.

CO 3. Analyse the various techniques for process synchronization and deadlock handling.

CO 4. Apply the various techniques for memory management

CO 5. Explain file and secondary storage management strategies.

CO 6. Describe the need for information protection mechanisms

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods

mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Textbooks

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley-India, 2015

Reference Books

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhare, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Web links and Video Lectures (e-Resources):

1. <https://youtu.be/mXw9ruZaxzQ>

2. <https://youtu.be/vBURTi97EkA>
3. https://www.youtube.com/watch?v=783KAB-tuE4&list=PLIemF3uozcAKTgsCIj82voMK3TMR0YE_f
4. <https://www.youtube.com/watch?v=3-ITLMMeeXY&list=PL3pGy4HtqwD0n7bQfHjPnsWzkeRn6mkO>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Assessment Methods
 - Case Study on Unix Based Systems (10 Marks)
 - Lab Assessment (25 Marks)

DATA STRUCTURES AND APPLICATIONS		Semester	3
Course Code	BCS304	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination type (SEE)	Theory		
<p>Course objectives: CLO 1. To explain fundamentals of data structures and their applications. CLO 2. To illustrate representation of Different data structures such as Stack, Queues, Linked Lists, Trees and Graphs. CLO 3. To Design and Develop Solutions to problems using Linear Data Structures CLO 4. To discuss applications of Nonlinear Data Structures in problem solving. CLO 5. To introduce advanced Data structure concepts such as Hashing and Optimal Binary Search Trees</p>			
<p>Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching 			
Module-1		8Hours	
<p>INTRODUCTION TO DATA STRUCTURES: Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations Review of pointers and dynamic Memory Allocation, ARRAYS and STRUCTURES: Arrays, Dynamic Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, representation of Multidimensional Arrays, Strings STACKS: Stacks, Stacks Using Dynamic Arrays, Evaluation and conversion of Expressions Text Book: Chapter-1:1.2 Chapter-2: 2.1 to 2.7 Chapter-3: 3.1,3.2,3.6 Reference Book 1: 1.1 to 1.4</p>			
Module-2		8Hours	
<p>QUEUES: Queues, Circular Queues, Using Dynamic Arrays, Multiple Stacks and queues. LINKED LISTS : Singly Linked, Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials Text Book: Chapter-3: 3.3, 3.4, 3.7 Chapter-4: 4.1 to 4.4</p>			
Module-3		8Hours	
<p>LINKED LISTS : Additional List Operations, Sparse Matrices, Doubly Linked List. TREES: Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees. Text Book: Chapter-4: 4.5,4.7,4.8 Chapter-5: 5.1 to 5.3, 5.5</p>			
Module-4		8Hours	
<p>TREES(Cont.): Binary Search trees, Selection Trees, Forests, Representation of Disjoint sets, Counting Binary Trees, GRAPHS: The Graph Abstract Data Types, Elementary Graph Operations Text Book: Chapter-5: 5.7 to 5.11 Chapter-6: 6.1, 6.2</p>			
Module-5		8Hours	

<p>HASHING: Introduction, Static Hashing, Dynamic Hashing PRIORITY QUEUES: Single and double ended Priority Queues, Leftist Trees INTRODUCTION TO EFFICIENT BINARY SEARCH TREES: Optimal Binary Search Trees Text Book: Chapter 8: 8.1 to 8.3 Chapter 9: 9.1, 9.2 Chapter 10: 10.1</p>
<p>Course outcome (Course Skill Set) At the end of the course the student will be able to: CO 1. Explain different data structures and their applications. CO 2. Apply Arrays, Stacks and Queue data structures to solve the given problems. CO 3. Use the concept of linked list in problem solving. CO 4. Develop solutions using trees and graphs to model the real-world problem. CO 5. Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees.</p>
<p>Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p>Continuous Internal Evaluation:</p> <ul style="list-style-type: none"> • For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks. • The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered • Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. • For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment. <p>Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</p> <p>Semester-End Examination: Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours).</p> <ol style="list-style-type: none"> 1. The question paper will have ten questions. Each question is set for 20 marks. 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. 3. The students have to answer 5 full questions, selecting one full question from each module. 4. Marks scored shall be proportionally reduced to 50 marks
<p>Suggested Learning Resources: Textbook:</p> <ol style="list-style-type: none"> 1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014

Reference Books:

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

Web links and Video Lectures (e-Resources):

- <http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html>
- <https://nptel.ac.in/courses/106/105/106105171/>
- <http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html>
- https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s
- <https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html>
- <https://nptel.ac.in/courses/106/102/106102064/>
- <https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html>
- <https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html>
- <https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html>
- <https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html>
- <https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html>
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01350159542807756812559/overview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
 - Case Study
 - Programming Assignment
 - Gate Based Aptitude Test
 - MOOC Assignment for selected Module

DATA STRUCTURES LABORATORY			
SEMESTER – III			
Course Code	BCSL305	CIE Marks	50
Number of Contact Hours/Week	0:0:2	SEE Marks	50
Total Number of Lab Contact Hours	28	Exam Hours	03
Credits – 1			
Course Learning Objectives:			
This laboratory course enables students to get practical experience in design, develop, implement, analyze and evaluation/testing of			
<ul style="list-style-type: none"> ● Dynamic memory management ● Linear data structures and their applications such as stacks, queues and lists ● Non-Linear data structures and their applications such as trees and graphs 			
Descriptions (if any):			
<ul style="list-style-type: none"> ● Implement all the programs in “C” Programming Language and Linux OS. 			
Programs List:			
1.	Develop a Program in C for the following: <ol style="list-style-type: none"> a) Declare a calendar as an array of 7 elements (A dynamically Created array) to represent 7 days of a week. Each Element of the array is a structure having three fields. The first field is the name of the Day (A dynamically allocated String), The second field is the date of the Day (A integer), the third field is the description of the activity for a particular day (A dynamically allocated String). b) Write functions create(), read() and display(); to create the calendar, to read the data from the keyboard and to print weeks activity details report on screen. 		
2.	Develop a Program in C for the following operations on Strings. <ol style="list-style-type: none"> a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.		
3.	Develop a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) <ol style="list-style-type: none"> a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations		

4.	Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
5.	Develop a Program in C for the following Stack Applications <ol style="list-style-type: none"> Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ Solving Tower of Hanoi problem with n disks
6.	Develop a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) <ol style="list-style-type: none"> Insert an Element on to Circular QUEUE Delete an Element from Circular QUEUE Demonstrate Overflow and Underflow situations on Circular QUEUE Display the status of Circular QUEUE Exit Support the program with appropriate functions for each of the above operations
7.	Develop a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: <i>USN, Name, Programme, Sem, PhNo</i> <ol style="list-style-type: none"> Create a SLL of N Students Data by using <i>front insertion</i>. Display the status of SLL and count the number of nodes in it Perform Insertion / Deletion at End of SLL Perform Insertion / Deletion at Front of SLL(Demonstration of stack) Exit
8.	Develop a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: <i>SSN, Name, Dept, Designation, Sal, PhNo</i> <ol style="list-style-type: none"> Create a DLL of N Employees Data by using <i>end insertion</i>. Display the status of DLL and count the number of nodes in it Perform Insertion and Deletion at End of DLL Perform Insertion and Deletion at Front of DLL Demonstrate how this DLL can be used as Double Ended Queue. Exit
9.	Develop a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes <ol style="list-style-type: none"> Represent and Evaluate a Polynomial $P(x,y,z) = 6x^2y^2z - 4yz^5 + 3x^3yz + 2xy^5z - 2xyz^3$ Find the sum of two polynomials $POLY1(x,y,z)$ and $POLY2(x,y,z)$ and store the result in $POLYSUM(x,y,z)$ Support the program with appropriate functions for each of the above operations
10.	Develop a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers . <ol style="list-style-type: none"> Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 Traverse the BST in Inorder, Preorder and Post Order Search the BST for a given element (KEY) and report the appropriate message Exit
11.	Develop a Program in C for the following operations on Graph(G) of Cities <ol style="list-style-type: none"> Create a Graph of N cities using Adjacency Matrix. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method

12.	<p>Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Develop a Program in C that uses Hash function $H: K \rightarrow L$ as $H(K)=K \text{ mod } m$ (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.</p>
<p>Laboratory Outcomes: The student should be able to:</p>	

- Analyze various linear and non-linear data structures
- Demonstrate the working nature of different types of data structures and their applications
- Use appropriate searching and sorting algorithms for the give scenario.
- Apply the appropriate data structure for solving real world problems

Conduct of Practical Examination:

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

Object Oriented Programming with JAVA		Semester	3
Course Code	BCS306A	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	28 Hours of Theory + 20 Hours of Practical	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		
Note - Students who have undergone “ Basics of Java Programming-BPLCK105C/205C” in first year are not eligible to opt this course			
Course objectives:			
<ul style="list-style-type: none"> ● To learn primitive constructs JAVA programming language. ● To understand Object Oriented Programming Features of JAVA. ● To gain knowledge on: packages, multithreaded programing and exceptions. 			
Teaching-Learning Process (General Instructions)			
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective			
<ol style="list-style-type: none"> 1. Use Online Java Compiler IDE: https://www.jdoodle.com/online-java-compiler/ or any other. 2. Demonstration of programing examples. 3. Chalk and board, power point presentations 4. Online material (Tutorials) and video lectures. 			
Module-1			
An Overview of Java: Object-Oriented Programming (Two Paradigms, Abstraction, The Three OOP Principles), Using Blocks of Code, Lexical Issues (Whitespace, Identifiers, Literals, Comments, Separators, The Java Keywords).			
Data Types, Variables, and Arrays: The Primitive Types (Integers, Floating-Point Types, Characters, Booleans), Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables.			
Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses.			
Control Statements: Java’s Selection Statements (if, The Traditional switch), Iteration Statements (while, do-while, for, The For-Each Version of the for Loop, Local Variable Type Inference in a for Loop, Nested Loops), Jump Statements (Using break, Using continue, return).			
Chapter 2, 3, 4, 5			
Module-2			
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection.			
Methods and Classes: Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, Recursion, Access Control, Understanding static, Introducing final, Introducing Nested and Inner Classes.			
Chapter 6, 7			
Module-3			
Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Local Variable Type Inference and Inheritance, The Object Class.			
Interfaces: Interfaces, Default Interface Methods, Use static Methods in an Interface, Private Interface Methods.			
Chapter 8, 9			

Module-4
<p>Packages: Packages, Packages and Member Access, Importing Packages.</p> <p>Exceptions: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions.</p> <p>Chapter 9, 10</p>
Module-5
<p>Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using <code>isAlive()</code> and <code>join()</code>, Thread Priorities, Synchronization, Interthread Communication, Suspending, Resuming, and Stopping Threads, Obtaining a Thread's State.</p> <p>Enumerations, Type Wrappers and Autoboxing: Enumerations (Enumeration Fundamentals, The <code>values()</code> and <code>valueOf()</code> Methods), Type Wrappers (Character, Boolean, The Numeric Type Wrappers), Autoboxing (Autoboxing and Methods, Autoboxing/Unboxing Occurs in Expressions, Autoboxing/Unboxing Boolean and Character Values).</p> <p>Chapter 11, 12</p>
<p>Course outcome (Course Skill Set)</p> <p>At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Demonstrate proficiency in writing simple programs involving branching and looping structures. 2. Design a class involving data members and methods for the given scenario. 3. Apply the concepts of inheritance and interfaces in solving real world problems. 4. Use the concept of packages and exception handling in solving complex problem 5. Apply concepts of multithreading, autoboxing and enumerations in program development
<p>Programming Experiments (Suggested and are not limited to)</p> <ol style="list-style-type: none"> 1. Develop a JAVA program to add TWO matrices of suitable order N (The value of N should be read from command line arguments). 2. Develop a stack class to hold a maximum of 10 integers with suitable methods. Develop a JAVA main method to illustrate Stack operations. 3. A class called Employee, which models an employee with an ID, name and salary, is designed as shown in the following class diagram. The method <code>raiseSalary</code> (percent) increases the salary by the given percentage. Develop the Employee class and suitable main method for demonstration. 4. A class called MyPoint, which models a 2D point with x and y coordinates, is designed as follows: <ul style="list-style-type: none"> • Two instance variables <code>x</code> (int) and <code>y</code> (int). • A default (or "no-arg") constructor that construct a point at the default location of (0, 0). • A overloaded constructor that constructs a point with the given x and y coordinates. • A method <code>setXY()</code> to set both x and y. • A method <code>getXY()</code> which returns the x and y in a 2-element int array. • A <code>toString()</code> method that returns a string description of the instance in the format "(x, y)". • A method called <code>distance(int x, int y)</code> that returns the distance from this point to another point at the given (x, y) coordinates • An overloaded <code>distance(MyPoint another)</code> that returns the distance from this point to the given MyPoint instance (called another) • Another overloaded <code>distance()</code> method that returns the distance from this point to the origin (0,0) Develop the code for the class MyPoint. Also develop a JAVA program (called TestMyPoint) to test all the methods defined in the class. 5. Develop a JAVA program to create a class named shape. Create three sub classes namely: circle, triangle and square, each class has two member functions named <code>draw ()</code> and <code>erase ()</code>. Demonstrate

polymorphism concepts by developing suitable methods, defining member data and main program.

6. Develop a JAVA program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.
7. Develop a JAVA program to create an interface Resizable with methods resizeWidth(int width) and resizeHeight(int height) that allow an object to be resized. Create a class Rectangle that implements the Resizable interface and implements the resize methods
8. Develop a JAVA program to create an outer class with a function display. Create another class inside the outer class named inner with a function called display and call the two functions in the main class.
9. Develop a JAVA program to raise a custom exception (user defined exception) for DivisionByZero using try, catch, throw and finally.
10. Develop a JAVA program to create a package named mypack and import & implement it in a suitable class.
11. Write a program to illustrate creation of threads using runnable class. (start method start each of the newly created thread. Inside the run method there is sleep() for suspend the thread for 500 milliseconds).
12. Develop a program to create a class MyThread in this class a constructor, call the base class constructor, using super and start the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Textbook

1. Java: The Complete Reference, Twelfth Edition, by Herbert Schildt, November 2021, McGraw-Hill, ISBN: 9781260463422

Reference Books

1. Programming with Java, 6th Edition, by E Balagurusamy, Mar-2019, McGraw Hill Education, ISBN: 9789353162337.
2. Thinking in Java, Fourth Edition, by Bruce Eckel, Prentice Hall, 2006 (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)

Web links and Video Lectures (e-Resources):

- Java Tutorial: <https://www.geeksforgeeks.org/java/>
- Introduction To Programming In Java (by Evan Jones, Adam Marcus and Eugene Wu): <https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/>
- Java Tutorial: <https://www.w3schools.com/java/>
- Java Tutorial: <https://www.javatpoint.com/java-tutorial>

Activity Based Learning (Suggested Activities)/ Practical Based learning

1. Installation of Java (Refer: https://www.java.com/en/download/help/index_installing.html)
2. Demonstration of online IDEs like geeksforgeeks, jdoodle or any other Tools
3. Demonstration of class diagrams for the class abstraction, type visibility, composition and inheritance

Assessment Method

- Programming Assignment / Course Project

OBJECT ORIENTED PROGRAMMING with C++		Semester	3
Course Code	BCS306B	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	2;0:2	SEE Marks	50
Total Hours of Pedagogy	28 Hours Theory + 20 Hours of Practical	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		
Note - Students who have undergone “ Introduction to C++ Programming-BPLCK105D/205D” in first year are not eligible to opt this course			
Course objectives: <ul style="list-style-type: none"> ● To understand object-oriented programming using C++ and Gain knowledge about the capability to store information together in an object. ● To illustrate the capability of a class to rely upon another class and functions. ● To Create and process data in files using file I/O functions ● To understand the generic programming features of C++ including Exception handling 			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. <ol style="list-style-type: none"> 1. Chalk and board, power point presentations 2. Online material (Tutorials) and video lectures. 3. Demonstration of programing examples. 			
Module-1		5 Hours	
An overview of C++: What is object-Oriented Programming? Introducing C++ Classes, The General Form of a C++ Program. Classes and Objects: Classes, Friend Functions, Friend Classes, Inline Functions, Parameterized Constructors, Static Class Members, When Constructors and Destructors are Executed, The Scope Resolution Operator, Passing Objects to functions, Returning Objects, Object Assignment Ch 11, Ch 12			
Module-2		6 Hours	
Arrays, Pointers, References, and the Dynamic Allocation Operators: Arrays of Objects, Pointers to Objects, The this Pointer, Pointers to derived types, Pointers to class members. Functions Overloading, Copy Constructors: Functions Overloading, Overloading Constructor Functions. Copy Constructors, Default Function Arguments, Function Overloading and Ambiguity. Ch 13, Ch 14			
Module-3		6 Hours	

<p>Operator Overloading: Creating a Member Operator Function, Operator Overloading Using a Friend Function, Overloading new and delete</p> <p>Inheritance: Base-Class Access Control, Inheritance and Protected Members, Inheriting Multiple Base Classes , Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes</p> <p>Ch 15, Ch 16</p>
<p>Module-4 5 Hours</p>
<p>Virtual Functions and Polymorphism: Virtual Functions, The Virtual Attribute is Inherited, Virtual Functions are Hierarchical, Pure Virtual Functions, Using Virtual Functions, Early vs Late Binding.</p> <p>Templates: Generic Functions, Applying Generic Functions, Generic Classes. The type name and export Keywords. The Power of Templates</p> <p>Ch 17, Ch 18</p>
<p>Module-5 6 Hours</p>
<p>Exception Handling: Exception Handling Fundamentals, Handling Derived-Class Exceptions, Exception Handling Options, Applying Exception Handling.</p> <p>The C++ I/O System Basics: C++ Streams, The C++ Classes, Formatted I/O</p> <p>File I/O: <fstream> and File Classes, Opening and Closing a File, Reading and Writing Text Files, Detecting EOF.</p> <p>Ch 19, Ch 20, Ch21</p>
<p>Course outcome (Course Skill Set)</p> <p>At the end of the course, the student will be able to :</p> <ol style="list-style-type: none"> 1 Illustrate the basic concepts of object-oriented programming. 2 Design appropriate classes for the given real world scenario. 3 Apply the knowledge of compile-time / run-time polymorphism to solve the given problem 4 Use the knowledge of inheritance for developing optimized solutions 5 Apply the concepts of templates and exception handling for the given problem 6 Use the concepts of input output streams for file operations
<p>Suggested Learning Resources:</p> <p>Books</p> <ol style="list-style-type: none"> 1. Herbert schildt, The Complete Reference C++, 4th edition, TMH, 2005 <p>Reference Books</p> <ol style="list-style-type: none"> 1. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd., Sixth Edition 2016. 2. Bhave , “ Object Oriented Programming With C++”, Pearson Education , 2004. 3. A K Sharma , “Object Oriented Programming with C++”, Pearson Education, 2014
<p>Web links and Video Lectures (e-Resources):</p>

<p>1. Basics of C++ - https://www.youtube.com/watch?v=BCIS40yzssA</p> <p>2. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw</p> <p>Tutorial Link:</p> <p>1. https://www.w3schools.com/cpp/cpp_intro.asp</p> <p>2. https://www.edx.org/course/introduction-to-c-3</p> <p>3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384364250678886443375_shared/overview</p>
<p>Activity Based Learning (Suggested Activities in Class)/ Practical Based learning</p> <ul style="list-style-type: none"> Group Assignment to develop small projects and demonstrate using C++

Practical Component

Sl.NO	Experiments
1	Develop a C++ program to find the largest of three numbers
2	Develop a C++ program to sort the elements in ascending and descending order.
3	Develop a C++ program using classes to display student name, roll number, marks obtained in two subjects and total score of student
4	Develop a C++ program for a bank employee to print name of the employee, account_no. & balance. Print invalid balance if amount < 500, Display the same, also display the balance after withdraw and deposit.
5	Develop a C++ program to demonstrate function overloading for the following prototypes. add(int a, int b) add(double a, double b
6	Develop a C++ program using Operator Overloading for overloading Unary minus operator.
7	Develop a C++ program to implement Multiple inheritance for performing arithmetic operation of two numbers
8	Develop a C++ program using Constructor in Derived classes to initialize alpha, beta and gamma and display corresponding values.
9	Develop a C++ program to create a text file, check file created or not, if created it will write some text into the file and then read the text from the file.
10	Develop a C++ program to write and read time in/from binary file using fstream
11	Develop a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.
12	Develop a C++ program that handles array out of bounds exception using C++.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

BSCK307 – Social Connect & Responsibility 2022 Scheme & syllabus for 3rd sem		Semester	3rd
Course Code	BSCK307	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:3:1	SEE Marks	-----
Total Hours of Pedagogy	40 hour Practical Session +15 hour Planning	Total Marks	100
Examination nature (No SEE – Only CIE)	For CIE Assessment - Activities Report Evaluation by College NSS Officer / HOD / Sports Dept / Any Dept.		
Credits	01 - Credit		

Course objectives: The course will enable the students to:

1. Provide a formal platform for students to communicate and connect to the surrounding.
2. create a responsible connection with the society.
3. Understand the community in general in which they work.
4. Identify the needs and problems of the community and involve them in problem –solving.
5. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
6. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

General Instructions - Pedagogy :

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
2. State the need for activities and its present relevance in the society and Provide real-life examples.
3. Support and guide the students for self-planned activities.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
5. Encourage the students for group work to improve their creative and analytical skills.

Contents :

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large.

The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, and semester-long activities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:

Social Connect & Responsibility - Contents**Part I:****Plantation and adoption of a tree:**

Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE)
They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - - Objectives, Visit, case study, report, outcomes.

Part II :**Heritage walk and crafts corner:**

Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - - Objectives, Visit, case study, report, outcomes.

Part III :**Organic farming and waste management:**

Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus -

Objectives, Visit, case study, report, outcomes.

Part IV:

Water conservation:

Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes.

Part V :

Food walk:

City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study, report, outcomes.

Course outcomes (Course Skill Set):

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

CO1: Communicate and connect to the surrounding.

CO2: Create a responsible connection with the society.

CO3: Involve in the community in general in which they work.

CO4: Notice the needs and problems of the community and involve them in problem –solving.

CO5: Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.

CO6: Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Activities:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversational will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

Duration :

A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E. /B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic ,and poetry) Faculty mentors has to design the evaluation system as per VTU guidelines of scheme & syllabus.

Guideline for Assessment Process:

Continuous Internal Evaluation (CIE):

After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall

be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below

Excellent : 80 to 100

Good : 60 to 79

Satisfactory : 40 to 59

Unsatisfactory and fail : <39

Special Note :

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Pedagogy – Guidelines :

It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	Plantation and adoption of a tree:	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc.....	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
2.	Heritage walk and crafts corner:	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.....	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
3.	Organic farming and waste management:	May be individual or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc.....	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
4.	Water conservation: & conservation techniques	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers / campus etc.....	site selection / proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
5.	Food walk: Practices in society	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.....	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty

Plan of Action (Execution of Activities)

Sl.NO	Practice Session Description	
1	Lecture session in field to start activities	
2	Students Presentation on Ideas	
3	Commencement of activity and its progress	
4	Execution of Activity	
5	Execution of Activity	
6	Execution of Activity	
7	Execution of Activity	
8	Case study based Assessment, Individual performance	
9	Sector/ Team wise study and its consolidation	
10	Video based seminar for 10 minutes by each student At the end of semester with Report.	
<ul style="list-style-type: none"> Each student should do activities according to the scheme and syllabus. At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion. At last consolidated report of all activities from 1st to 5th, compiled report should be submitted as per the instructions and scheme. <p>-----</p>		
Assessment Details for CIE (both CIE and SEE)		
Weightage	CIE – 100%	<ul style="list-style-type: none"> Implementation strategies of the project (NSS work). The last report should be signed by NSS Officer, the HOD and principal. At last report should be evaluated by the NSS officer of the institute. Finally the consolidated marks sheet should be sent to the university and also to be made available at LIC visit.
Field Visit, Plan, Discussion	10 Marks	
Commencement of activities and its progress	20 Marks	
Case study based Assessment Individual performance with report	20 Marks	
Sector wise study & its consolidation 5*5 = 25	25 Marks	
Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25	25 Marks	
Total marks for the course in each semester	100 Marks	
<p>For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.</p> <p>Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.</p>		

Data Analytics with Excel		Semester	3
Course Code	BCS358A	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	100
Examination type (SEE)	Practical		
Course objectives: <ul style="list-style-type: none"> ● To Apply analysis techniques to datasets in Excel ● Learn how to use Pivot Tables and Pivot Charts to streamline your workflow in Excel ● Understand and Identify the principles of data analysis ● Become adept at using Excel functions and techniques for analysis ● Build presentation ready dashboards in Excel 			
Sl.NO	Experiments		
1	Getting Started with Excel: Creation of spread sheets, Insertion of rows and columns, Drag & Fill, use of Aggregate functions.		
2	Working with Data : Importing data, Data Entry & Manipulation, Sorting & Filtering.		
3	Working with Data: Data Validation, Pivot Tables & Pivot Charts.		
4	Data Analysis Process: Conditional Formatting, What-If Analysis, Data Tables, Charts & Graphs.		
5	Cleaning Data with Text Functions: use of UPPER and LOWER, TRIM function, Concatenate.		
6	Cleaning Data Containing Date and Time Values: use of DATEVALUE function, DATEADD and DATEDIF, TIMEVALUE functions.		
7	Conditional Formatting: formatting, parsing, and highlighting data in spreadsheets during data analysis.		
8	Working with Multiple Sheets: work with multiple sheets within a workbook is crucial for organizing and managing data, perform complex calculations and create comprehensive reports.		
9	Create worksheet with following fields: Empno, Ename, Basic Pay(BP), Travelling Allowance(TA), Dearness Allowance(DA), House Rent Allowance(HRA), Income Tax(IT), Provident Fund(PF), Net Pay(NP). Use appropriate formulas to calculate the above scenario. Analyse the data using appropriate chart and report the data.		
10	Create worksheet on Inventory Management: Sheet should contain Product code, Product name, Product type, MRP, Cost after % of discount, Date of purchase. Use appropriate formulas to calculate the above scenario. Analyse the data using appropriate chart and report the data.		

11	Create worksheet on Sales analysis of Merchandise Store: data consisting of Order ID, Customer ID, Gender, age, date of order, month, online platform, Category of product, size, quantity, amount, shipping city and other details. Use of formula to segregate different categories and perform a comparative study using pivot tables and different sort of charts.
12	Generation of report & presentation using Autofilter & macro.

Course outcomes (Course Skill Set):

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

- Use advanced functions and productivity tools to assist in developing worksheets.
- Manipulate data lists using Outline and PivotTables.
- Use Consolidation to summarise and report results from multiple worksheets.
- Apply Macros and Autofilter to solve the given real world scenario.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.

- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- **Berk & Carey** - Data Analysis with Microsoft® Excel: Updated for Office 2007®, Third Edition, © 2010 Brooks/Cole, Cengage Learning, ISBN-13: 978-0-495-39178-4
- **Wayne L. Winston** - Microsoft Excel 2019: Data Analysis And Business Modeling, PHI, ISBN: 9789389347180
- **Aryan Gupta** - Data Analysis in Excel: The Best Guide. (<https://www.simplilearn.com/tutorials/excel-tutorial/data-analysis-excel>)

R Programming		Semester	3
Course Code	BCS358B	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	02
Examination type (SEE)	Practical		
Course objectives:			
<ul style="list-style-type: none"> ● To explore and understand how R and R Studio interactive environment. ● To understand the different data Structures, data types in R. ● To learn and practice programming techniques using R programming. ● To import data into R from various data sources and generate visualizations. ● To draw insights from datasets using data analytics techniques. 			
Sl.NO	Experiments		
1	Demonstrate the steps for installation of R and R Studio. Perform the following: <ol style="list-style-type: none"> a) Assign different type of values to variables and display the type of variable. Assign different types such as Double, Integer, Logical, Complex and Character and understand the difference between each data type. b) Demonstrate Arithmetic and Logical Operations with simple examples. c) Demonstrate generation of sequences and creation of vectors. d) Demonstrate Creation of Matrices e) Demonstrate the Creation of Matrices from Vectors using Binding Function. f) Demonstrate element extraction from vectors, matrices and arrays Suggested Reading – Text Book 1 – Chapter 1 (What is R, Installing R, Choosing an IDE – RStudio, How to Get Help in R, Installing Extra Related Software), Chapter 2 (Mathematical Operations and Vectors, Assigning Variables, Special Numbers, Logical Vectors), Chapter 3 (Classes, Different Types of Numbers, Other Common Classes, Checking and Changing Classes, Examining Variables)		
2	Assess the Financial Statement of an Organization being supplied with 2 vectors of data: Monthly Revenue and Monthly Expenses for the Financial Year. You can create your own sample data vector for this experiment) Calculate the following financial metrics: <ol style="list-style-type: none"> a. Profit for each month. b. Profit after tax for each month (Tax Rate is 30%). c. Profit margin for each month equals to profit after tax divided by revenue. d. Good Months – where the profit after tax was greater than the mean for the year. e. Bad Months – where the profit after tax was less than the mean for the year. f. The best month – where the profit after tax was max for the year. g. The worst month – where the profit after tax was min for the year. Note: <ol style="list-style-type: none"> a. All Results need to be presented as vectors b. Results for Dollar values need to be calculated with \$0.01 precision, but need to be presented in Units of \$1000 (i.e 1k) with no decimal points c. Results for the profit margin ratio need to be presented in units of % with no decimal point. d. It is okay for tax to be negative for any given month (deferred tax asset) e. Generate CSV file for the data. Suggested Reading – Text Book 1 – Chapter 4 (Vectors, Combining Matrices)		
3	Develop a program to create two 3 X 3 matrices A and B and perform the following operations a) Transpose of the matrix b) addition c) subtraction d) multiplication Suggested Reading – Text Book 1 – Chapter 4 (Matrices and Arrays – Array Arithmetic)		
4	Develop a program to find the factorial of given number using recursive function calls. Suggested Reading – Reference Book 1 – Chapter 5 (5.5 – Recursive Programming) Text Book 1 – Chapter 8 (Flow Control and Loops – If and Else, Vectorized If, while loops, for loops), Chapter 6 (Creating and Calling Functions, Passing Functions to and from other functions)		

5	<p>Develop an R Program using functions to find all the prime numbers up to a specified number by the method of Sieve of Eratosthenes.</p> <p>Suggested Reading – Reference Book 1 - Chapter 5 (5.5 – Recursive Programming) Text Book 1 – Chapter 8 (Flow Control and Loops – If and Else, Vectorized If, while loops, for loops), Chapter 6 (Creating and Calling Functions, Passing Functions to and from other functions)</p>																		
6	<p>The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to:</p> <p>a) Find the Pearson and Spearman correlation coefficients. Are they similar? b) Plot the data using the plot command. c) Plot the logarithm (log) of each variable and see if that makes a difference.</p> <p>Suggested Reading – Text Book 1 –Chapter 12 – (Built-in Datasets) Chapter 14 – (Scatterplots) Reference Book 2 – 13.2.5 (Covariance and Correlation)</p>																		
7	<p>Develop R program to create a Data Frame with following details and do the following operations.</p> <table border="1" data-bbox="272 636 1482 972"> <thead> <tr> <th>itemCode</th> <th>itemCategory</th> <th>itemPrice</th> </tr> </thead> <tbody> <tr> <td>1001</td> <td>Electronics</td> <td>700</td> </tr> <tr> <td>1002</td> <td>Desktop Supplies</td> <td>300</td> </tr> <tr> <td>1003</td> <td>Office Supplies</td> <td>350</td> </tr> <tr> <td>1004</td> <td>USB</td> <td>400</td> </tr> <tr> <td>1005</td> <td>CD Drive</td> <td>800</td> </tr> </tbody> </table> <p>a) Subset the Data frame and display the details of only those items whose price is greater than or equal to 350. b) Subset the Data frame and display only the items where the category is either “Office Supplies” or “Desktop Supplies” c) Create another Data Frame called “item-details” with three different fields itemCode, ItemQtyonHand and ItemReorderLvl and merge the two frames</p> <p>Suggested Reading –Textbook 1: Chapter 5 (Lists and Data Frames)</p>	itemCode	itemCategory	itemPrice	1001	Electronics	700	1002	Desktop Supplies	300	1003	Office Supplies	350	1004	USB	400	1005	CD Drive	800
itemCode	itemCategory	itemPrice																	
1001	Electronics	700																	
1002	Desktop Supplies	300																	
1003	Office Supplies	350																	
1004	USB	400																	
1005	CD Drive	800																	
8	<p>Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Develop R program to generate histogram by using appropriate arguments for the following statements.</p> <p>a) Assigning names, using the air quality data set. b) Change colors of the Histogram c) Remove Axis and Add labels to Histogram d) Change Axis limits of a Histogram e) Add Density curve to the histogram</p> <p>Suggested Reading –Reference Book 2 – Chapter 7 (7.4 – The ggplot2 Package), Chapter 24 (Smoothing and Shading)</p>																		
9	<p>Design a data frame in R for storing about 20 employee details. Create a CSV file named “input.csv” that defines all the required information about the employee such as id, name, salary, start_date, dept. Import into R and do the following analysis.</p> <p>a) Find the total number rows & columns b) Find the maximum salary c) Retrieve the details of the employee with maximum salary d) Retrieve all the employees working in the IT Department. e) Retrieve the employees in the IT Department whose salary is greater than 20000 and write these</p>																		

	<p>details into another file “output.csv”</p> <p>Suggested Reading – Text Book 1 – Chapter 12(CSV and Tab Delimited Files)</p>
10	<p>Using the built in dataset mtcars which is a popular dataset consisting of the design and fuel consumption patterns of 32 different automobiles. The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973-74 models). Format A data frame with 32 observations on 11 variables : [1] mpg Miles/(US) gallon, [2] cyl Number of cylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axle ratio,[6] wt Weight (lb/1000) [7] qsec 1/4 mile time, [8] vs V/S, [9] am Transmission (0 = automatic, 1 = manual), [10] gear Number of forward gears, [11] carb Number of carburetors</p> <p>Develop R program, to solve the following:</p> <ol style="list-style-type: none"> What is the total number of observations and variables in the dataset? Find the car with the largest hp and the least hp using suitable functions Plot histogram / density for each variable and determine whether continuous variables are normally distributed or not. If not, what is their skewness? What is the average difference of gross horse power(hp) between automobiles with 3 and 4 number of cylinders(cyl)? Also determine the difference in their standard deviations. Which pair of variables has the highest Pearson correlation? <p>References (Web links):</p> <ol style="list-style-type: none"> https://cran.r-project.org/web/packages/explore/vignettes/explore_mtcars.html https://www.w3schools.com/r/r_stat_data_set.asp https://rpubs.com/BillB/217355
11	<p>Demonstrate the progression of salary with years of experience using a suitable data set (You can create your own dataset). Plot the graph visualizing the best fit line on the plot of the given data points. Plot a curve of Actual Values vs. Predicted values to show their correlation and performance of the model. Interpret the meaning of the slope and y-intercept of the line with respect to the given data. Implement using lm function. Save the graphs and coefficients in files. Attach the predicted values of salaries as a new column to the original data set and save the data as a new CSV file.</p> <p>Suggested Reading – Reference Book 2 – Chapter 20 (General Concepts, Statistical Inference, Prediction)</p>
<p>Course outcomes (Course Skill Set):</p> <p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> Explain the fundamental syntax of R data types, expressions and the usage of the R-Studio IDE Develop a program in R with programming constructs: conditionals, looping and functions. Apply the list and data frame structure of the R programming language. Use visualization packages and file handlers for data analysis.. 	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation

rubrics shall be decided jointly by examiners.

- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

● General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

● Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

Book:

1. Cotton, R. (2013). Learning R: A Step by Step Function Guide to Data Analysis. 1st ed. O'Reilly Media Inc.

References:

1. Jones, O., Maillardet, R. and Robinson, A. (2014). Introduction to Scientific Programming and Simulation Using R. Chapman & Hall/CRC, The R Series.
2. Davies, T.M. (2016) The Book of R: A First Course in Programming and Statistics. No Starch Press.

Project Management with Git		Semester	3
Course Code	BCS358C	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0: 0 : 2: 0	SEE Marks	50
Credits	01	Exam Marks	100
Examination type (SEE)	Practical		
Course objectives:			
<ul style="list-style-type: none"> • .To familiar with basic command of Git • To create and manage branches • To understand how to collaborate and work with Remote Repositories • To familiar with virion controlling commands 			
Sl.NO	Experiments		
1	Setting Up and Basic Commands Initialize a new Git repository in a directory. Create a new file and add it to the staging area and commit the changes with an appropriate commit message.		
2	Creating and Managing Branches Create a new branch named "feature-branch." Switch to the "master" branch. Merge the "feature-branch" into "master."		
3	Creating and Managing Branches Write the commands to stash your changes, switch branches, and then apply the stashed changes.		
4	Collaboration and Remote Repositories Clone a remote Git repository to your local machine.		
5	Collaboration and Remote Repositories Fetch the latest changes from a remote repository and rebase your local branch onto the updated remote branch.		
6	Collaboration and Remote Repositories Write the command to merge "feature-branch" into "master" while providing a custom commit message for the merge.		
7	Git Tags and Releases Write the command to create a lightweight Git tag named "v1.0" for a commit in your local repository.		
8	Advanced Git Operations		

	Write the command to cherry-pick a range of commits from "source-branch" to the current branch.
9	Analysing and Changing Git History Given a commit ID, how would you use Git to view the details of that specific commit, including the author, date, and commit message?
10	Analysing and Changing Git History Write the command to list all commits made by the author "JohnDoe" between "2023-01-01" and "2023-12-31."
11	Analysing and Changing Git History Write the command to display the last five commits in the repository's history.
12	Analysing and Changing Git History Write the command to undo the changes introduced by the commit with the ID "abc123".
Course outcomes (Course Skill Set): At the end of the course the student will be able to: <ul style="list-style-type: none">• Use the basics commands related to git repository• Create and manage the branches• Apply commands related to Collaboration and Remote Repositories• Use the commands related to Git Tags, Releases and advanced git operations• Analyse and change the git history	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.

- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- Version Control with Git, 3rd Edition, by Prem Kumar Ponuthorai, Jon Loeliger Released October 2022, Publisher(s): O'Reilly Media, Inc.
- Pro Git book, written by Scott Chacon and Ben Straub and published by Apress, <https://git-scm.com/book/en/v2>
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944433473699842782_shared/overview
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01330134712177459211926_shared/overview

Data Visualization with Python		Semester	III
Course Code	BCS358D	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0: 0: 2: 0	SEE Marks	50
Credits	01	Exam Hours	100
Examination type (SEE)	Practical		
Course objectives:			
<ul style="list-style-type: none"> • CLO 1. Demonstrate the use of IDLE or PyCharm IDE to create Python Applications • CLO 2. Using Python programming language to develop programs for solving real-world problems • CLO 3. Implementation of Matplotlib for drawing different Plots • CLO 4. Demonstrate working with Seaborn, Bokeh. • CLO 5. Working with Plotly for 3D, Time Series and Maps. 			
Experiments			
Sl. No.	PART A – List of problems for which student should develop program and execute in the Laboratory		
1	<p>a) Write a python program to find the best of two test average marks out of three test's marks accepted from the user.</p> <p>b) Develop a Python program to check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number.</p> <p>Datatypes: https://www.youtube.com/watch?v=gCCVsvgR2KU Operators: https://www.youtube.com/watch?v=v5MR5JnKcZI Flow Control: https://www.youtube.com/watch?v=PqFKRqpHrjw For loop: https://www.youtube.com/watch?v=0ZvaDa8eT5s While loop: https://www.youtube.com/watch?v=HZARImviDxg Exceptions: https://www.youtube.com/watch?v=6SPDvPK38tw</p>		
2	<p>a) Defined as a function F as $F_n = F_{n-1} + F_{n-2}$. Write a Python program which accepts a value for N (where $N > 0$) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed.</p> <p>b) Develop a python program to convert binary to decimal, octal to hexadecimal using functions.</p> <p>Functions: https://www.youtube.com/watch?v=BVfCWuca9nw Arguments: https://www.youtube.com/watch?v=ijXMGpoMkhQ Return value: https://www.youtube.com/watch?v=nuNXiEDnM44</p>		
3	<p>a) Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters.</p> <p>b) Write a Python program to find the string similarity between two given strings</p> <p>Sample Output:</p> <p>Original string: Python Exercises Python Exercises Similarity between two said strings:</p> <p>Sample Output:</p> <p>Original string: Python Exercises Python Exercise Similarity between two said strings:1.0 0.967741935483871</p> <p>Strings: https://www.youtube.com/watch?v=ISItwlnF0eU String functions: https://www.youtube.com/watch?v=9a3CxJyTq00</p>		

4	<p>a) Write a Python program to Demonstrate how to Draw a Bar Plot using Matplotlib.</p> <p>b) Write a Python program to Demonstrate how to Draw a Scatter Plot using Matplotlib.</p> <p>https://www.youtube.com/watch?v=RRHQ6Fs1b8w&list=PLjVLYmrlmjGcC0B_FP3bkJ-JIPkV5GuZR&index=3</p> <p>https://www.youtube.com/watch?v=7ABCuhWO9II&list=PLjVLYmrlmjGcC0B_FP3bkJ-JIPkV5GuZR&index=4</p>
5	<p>a) Write a Python program to Demonstrate how to Draw a Histogram Plot using Matplotlib.</p> <p>b) Write a Python program to Demonstrate how to Draw a Pie Chart using Matplotlib.</p> <p>https://www.youtube.com/watch?v=Qk7caotaQUQ&list=PLjVLYmrlmjGcC0B_FP3bkJ-JIPkV5GuZR&index=6</p> <p>https://www.youtube.com/watch?v=PSji21jUNO0&list=PLjVLYmrlmjGcC0B_FP3bkJ-JIPkV5GuZR&index=7</p>
6	<p>a) Write a Python program to illustrate Linear Plotting using Matplotlib.</p> <p>b) Write a Python program to illustrate liner plotting with line formatting using Matplotlib.</p> <p>https://www.youtube.com/watch?v=UO98IJO3QGI&list=PL-osiE80TeTvipOqomVEeZ1HRrcEvtZB</p>
7	<p>Write a Python program which explains uses of customizing seaborn plots with Aesthetic functions.</p> <p>https://www.youtube.com/watch?v=6GUZXDef2U0</p>
8	<p>Write a Python program to explain working with bokeh line graph using Annotations and Legends.</p> <p>a) Write a Python program for plotting different types of plots using Bokeh.</p> <p>https://www.youtube.com/watch?v=HDvxYoRadcA</p>
9	<p>Write a Python program to draw 3D Plots using Plotly Libraries.</p> <p>https://www.youtube.com/watch?v=cCck7hCanpw&list=PLE50-dh6JzC4onX-qkv9H3HtPbBVA8M94&index=4</p>

10	<p>a) Write a Python program to draw Time Series using Plotly Libraries.</p> <p>b) Write a Python program for creating Maps using Plotly Libraries.</p> <p>https://www.youtube.com/watch?v=xnJ2TnrGYik&list=PLE50-dh6JzC4onX-qkv9H3HtPbBVA8M94&index=5</p> <p>https://www.youtube.com/watch?v=D35m2CdMhVs&list=PLE50-dh6JzC4onX-qkv9H3HtPbBVA8M94&index=6</p>
<p>Python (Full Course): https://www.youtube.com/watch?v=_uQrJ0TkZlc</p>	
Pedagogy	<p>For the above experiments the following pedagogy can be considered. Problem based learning, Active learning, MOOC, Chalk &Talk</p>
<p>Course outcomes (Course Skill Set): At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> CO 1. Demonstrate the use of IDLE or PyCharm IDE to create Python Applications CO 2. Use Python programming constructs to develop programs for solving real-world problems CO 3. Use Matplotlib for drawing different Plots CO 4. Demonstrate working with Seaborn, Bokeh for visualization. CO 5. Use Plotly for drawing Time Series and Maps. 	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

- **Weightage of marks for PART A is 80% and for PART B is 20%. General rubrics suggested to be followed for part A and part B.**
- **Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero (Not allowed for Part B).**
- **The duration of SEE is 03 hours**

Rubrics suggested in Annexure-II of Regulation book**Textbooks:**

1. Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automatetheboringstuff.com/>)
2. Reema Thareja "Python Programming Using Problem Solving Approach" Oxford University Press.
3. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf>)
4. Jake VanderPlas "Python Data Science Handbook" 1st Edition, O'REILLY.

Course Title:	Introduction to Web Programming		
Course Code:	BPLCK105A/BPLCK205A	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Course objectives <ul style="list-style-type: none"> ● To use the syntax and semantics of HTML and XHTML ● To develop different parts of a web page ● To understand how CSS can enhance the design of a webpage. ● To create and apply CSS styling to a webpage ● To get familiarity with the JavaScript language and understand Document Object Model handling of Java Script 			
Teaching-Learning Process These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching -Learning more effective <ol style="list-style-type: none"> 1. Use https://pythontutor.com/visualize.html#mode=edit in order to visualize the operations of Javascripts 2. Chalk and talk 3. Online demonstration 4. Hands on problem solving 			
Module-1 (8 hours)			
Module-1:Traditional HTML and XHTML: First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML and XHTML DTDs: The Specifications Up Close, (X)HTML Document Structure, Browsers and (X)HTML, The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup—Two Paths?			
TextBook1: Chapter 1			
Module-2 (8 hours)			
Module-2: HTML5: Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications			
TextBook1: Chapter 2			
Module-3 (8 hours)			
Module-3: Cascading Style Sheets (CSS) Introduction, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property , Case			

Study: Description of a Small City's Core Area.

TextBook2-: Chapter 3

Module-4 (8 hours)

Module-4: Tables and CSS, Links and Images

Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo-Class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element .

TextBook2: 5.2 to 5.8, 6.2, 6.3, 6.6., 6.7, 6.9, 6.10, 6.12, 7.2 to 7.4

Module-5 (8 hours)

Module-5: Introduction to JavaScript: Functions, DOM, Forms, and Event Handlers

History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, Accessing a Form's Control Values, reset and focus Methods

TextBook2: 8.2 to 8,13, 8.15, 8.16

Course outcome (Course Skill Set)

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

C01	Explain the historical context and justification for HTML over XHTML
C02	Develop HTML5 documents and adding various semantic markup tags
C03	Analyse various attributes, values and types of CSS
C04	Implement core constructs and event handling mechanisms of JavaScript.

Programming Assignments:

1. Create an XHTML page using tags to accomplish the following:
 - (i) A paragraph containing text "All that glitters is not gold". Bold face and italicize this text
 - (ii) Create equation:

$$x = 1/3(y_1^2 + z_1^2)$$
 - (iii) Put a background image to a page and demonstrate all attributes of background image
 - (iv) Create unordered list of 5 fruits and ordered list of 3 flowers

2. Create following table using XHTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary

Department	Sem1	<i>SubjectA</i>
		<i>SubjectB</i>
		<i>SubjectC</i>
	Sem2	<i>SubjectE</i>
		<i>SubjectF</i>
		<i>SubjectG</i>
	Sem3	<i>SubjectH</i>
		<i>SubjectI</i>
		<i>SubjectJ</i>

3. Use HTML5 for performing following tasks:
- Draw a square using HTML5 SVG , fill the square with green color and make 6px brown stroke width
 - Write the following mathematical expression by using HTML5 MathML.
$$d=x^2-y^2$$
 - Redirecting current page to another page after 5 seconds using HTML5 meta tag
4. Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>, <figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives information about travel experience.
5. Create a class called **income**, and make it a background color of #0ff. Create a class called **expenses**, and make it a background color of #f0f. Create a class called **profit**, and make it a background color of #f00.

Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text. Further create following line of text in the same document:

~~The current price is 50₹~~ and new price is 40₹

6. Change the tag **li** to have the following properties:
- A display status of inline
 - A medium, double-lined, black border
 - No list style type
- Add the following properties to the style for **li**:
- Margin of 5px
 - Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px to the left

Also demonstrate list style type with user defined image logos

7. Create following web page using HTML and CSS with tabular layout

Sign up today

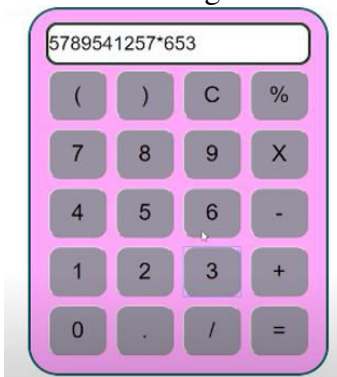
Name:

E-mail:

Password:

Confirm password:

8. Create following calculator interface with HTML and CSS



9. Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay

10. Create a webpage containing 3 overlapping images using HTML, CSS and JS. Further when the mouse is over any image, it should be on the top and fully displayed.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component **20 Marks**.

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totaling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to **30 marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (**duration 03 hours**) at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for **20 marks**.

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE):

SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The

laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.

- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

TextBook-1: HTML & CSS: The Complete Reference Thomas A. Powell, , Fifth Edition, Tata McGraw Hill,

TextBook-2: WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition

Web links and Video Lectures (e-Resources):

https://onlinecourses.swayam2.ac.in/aic20_sp11/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Develop simple GUI interfaces for a computer program to interact with users

COs and POs Mapping (Individual teacher has to fill up)

COs	POs						
	1	2	3	4	5	6	7
C01							
C02							
C03							
C04							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	Introduction to Python Programming		
Course Code:	BPLCK105B/205B	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<p>Course objectives</p> <ul style="list-style-type: none"> • Learn the syntax and semantics of the Python programming language. • Illustrate the process of structuring the data using lists, tuples • Appraise the need for working with various documents like Excel, PDF, Word and Others. • Demonstrate the use of built-in functions to navigate the file system. • Implement the Object Oriented Programming concepts in Python. 			
<p>Teaching-Learning Process These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective</p> <ol style="list-style-type: none"> 1. Use https://pythontutor.com/visualize.html#mode=edit in order to visualize the python code 2. Demonstrate and visualize basic data types (list, tuple, dictionary). 3. Chalk and talk 4. online and videos 			
Module-1 (08 hrs)			
<p>Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(), Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number Textbook 1: Chapters 1 – 3</p>			
Module-2 (08 hrs)			
<p>Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References, Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things, Textbook 1: Chapters 4 – 5</p>			
Module-3 (08 hrs)			

	<p>Manipulating Strings: Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup</p> <p>Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the print.format() Function, Project: Generating Random Quiz Files, Project: Multiclipboard,</p> <p>Textbook 1: Chapters 6 , 8</p>
	Module-4 (08 hrs)
	<p>Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates, Project: Backing Up a Folder into a ZIP File,</p> <p>Debugging: Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE's Debugger.</p> <p>Textbook 1: Chapters 9-10</p>
	Module-5 (08 hrs)
	<p>Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying,</p> <p>Classes and functions: Time, Pure functions, Modifiers, Prototyping versus planning,</p> <p>Classes and methods: Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The __str__ method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation,</p> <p>Textbook 2: Chapters 15 – 17</p>
Course outcome (Course Skill Set)	
At the end of the course the student will be able to:	
C01	Demonstrate proficiency in handling loops and creation of functions.
C02	Identify the methods to create and manipulate lists, tuples and dictionaries.
C03	Develop programs for string processing and file organization
C04	Interpret the concepts of Object-Oriented Programming as used in Python.
Programming Exercises:	
<ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> a. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages. b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not. 2. <ol style="list-style-type: none"> a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console. b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R). 3. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages. 4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message. 5. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary 	

with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]

6. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].
7. Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.
8. Write a function named DivExp which takes TWO parameters a, b and returns a value c ($c=a/b$). Write suitable assertion for $a>0$ in function DivExp and raise an exception for when $b=0$. Develop a suitable program which reads two values from the console and calls a function DivExp.
9. Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N ($N \geq 2$) complex numbers and to compute the addition of N complex numbers.
10. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use __init__() method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the score card details.]

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

The CIE marks for the theory component of the IC shall be 30 marks and for the laboratory component 20 Marks.

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totaling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to 30 marks

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be

evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.

- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (**duration 03 hours**) at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for **20 marks**.

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE):

SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.

- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

Suggested Learning Resources:**Text Books**

1. Al Sweigart, “**Automate the Boring Stuff with Python**”, 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automatetheboringstuff.com/>)
(Chapters 1 to 18, except 12) for lambda functions use this link:
<https://www.learnbyexample.org/python-lambda-function/>
2. Allen B. Downey, “**Think Python: How to Think Like a Computer Scientist**”, 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf>)
(Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above link)

Web links and Video Lectures (e-Resources):

- <https://www.learnbyexample.org/python/>
- <https://www.learnpython.org/>
- <https://pythontutor.com/visualize.html#mode=edit>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes for list, tuple, string dictionary slicing operations using below link
<https://github.com/sushantkhara/Data-Structures-And-Algorithms-with-Python/raw/main/Python%20%20%20400%20exercises%20and%20solutions%20for%20beginners.pdf>

COs and POs Mapping (Individual teacher has to fill up)

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							
CO5							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	Basics of Java Programming		
Course Code:	BPLCK105C/BPLCK205C	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
Course objectives <ul style="list-style-type: none"> ● Learn fundamental features of object oriented language and JAVA ● Set up Java JDK environment to create, debug and run simple Java programs. ● Learn object oriented concepts using programming examples. ● Study the concepts of importing of packages and exception handling mechanism. 			
Teaching-Learning Process These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching -Learning more effective <ol style="list-style-type: none"> 1. Use https://pythontutor.com/visualize.html#mode=edit in order to visualize the Java programs 2. Chalk and talk 3. Onine demonstration 4. Hands on problem solving 			
Module-1 (8 hours)			
An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings Text book 1: Ch 2, Ch 3			
Module-2 (8 hours)			
Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java"s Selection Statements, Iteration Statements, Jump Statements. Text book 1: Ch 4, Ch 5			
Module-3 (8 hours)			
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize() Method, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited Text book 1: Ch 6, Ch 7 (7.1-7.9)			
Module-4 (8 hours)			
Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class. Text book 1: Ch 8			
Module-5 (8 hours)			

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java"s Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions.

Text book 1: Ch 9, Ch 10

Course outcome (Course Skill Set)

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

CO1	To explain the features and object oriented concepts in JAVA programming
CO2	To analyse working of bitwise operators in JAVA
CO3	To develop simple programs based on polymorphism and inheritance
CO4	To describe the concepts of importing packages and exception handling mechanism

Programming Assignments

1. Write a JAVA program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula.
2. Write a JAVA program for multiplication of two arrays.
3. Demonstrate the following operations and sign extension with Java programs
(i) << (ii) >> (iii) >>>
4. Write a JAVA program to sort list of elements in ascending and descending order
5. Create a JAVA class called Student with the following details as variables within it.

USN

NAME

BRANCH

PHONE

PERCENTAGE

Write a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.

6. Write a JAVA program demonstrating Method overloading and Constructor overloading.
7. Design a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a JAVA program to read and display at least 3 staff objects of all three categories.
8. Demonstrate dynamic dispatch using abstract class in JAVA.
9. Create two packages P1 and P2. In package P1, create class A, class B inherited from A, class C. In package P2, create class D inherited from class A in package P1 and class E. Demonstrate working of access modifiers (private, public, protected, default) in all these classes using JAVA.
10. Write a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate working of ArrayIndexOutOfBoundsException.

Assessment Details (both CIE and SEE)**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component **20 Marks**.

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totaling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to **30 marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (**duration 03 hours**) at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC for **20 marks**.

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only.

However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English).
The duration of SEE is 03 hours.

The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 30 marks. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

- Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc22_cs47/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Conduct on spot problem solving based on JAVA
- Develop simple GUI interfaces for a computer program to interact with users

COs and POs Mapping (Individual teacher has to fill up)

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	Introduction to C++ Programming		
Course Code:	BPLCK105D/BPLCK205D	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<p>Course objectives</p> <ul style="list-style-type: none"> ● Understanding about object oriented programming and Gain knowledge about the capability to store information together in an object. ● Understand the capability of a class to rely upon another class and functions. ● Understand about constructors which are special type of functions. ● Create and process data in files using file I/O functions ● Use the generic programming features of C++ including Exception handling 			
<p>Teaching-Learning Process These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching -Learning more effective</p> <ol style="list-style-type: none"> 1. Chalk and talk 2. Onine demonstration 3. Hands on problem solving 			
Module-1 (8 hours)			
<p>Introduction to Object Oriented Programming: Computer programming background- C++ overview. First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.</p> <p>Textbook 1: Chapter 1(1.1 to 1.8)</p>			
Module-2 (8 hours)			
<p>Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading.</p> <p>Textbook 2: Chapter 3(3.2,3.3,3.4,3.13,3.14,3.19, 3.20) , chapter 4(4.3,4.4,4.5,4.6,4.7,4.9)</p>			
Module-3 (8 hours)			
<p>Inheritance & Polymorphism: Derived class Constructors, destructors-Types of Inheritance-Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.</p> <p>Textbook 2: Chapter 6 (6.2,6.11) chapter 8 (8.1 to,8.8)</p>			
Module-4 (8 hours)			
<p>I/O Streams: C++ Class Hierarchy- File Stream-Text File Handling- Binary File Handling during file operations.</p> <p>Textbook 1: Chapter 12(12.5) , Chapter 13 (13.6,13.7)</p>			

Module-5 (8 hours)

Exception Handling: Introduction to Exception - Benefits of Exception handling- Try and catch blockThrow statement- Pre-defined exceptions in C++

Textbook 2: Chapter 13 (13.2 to13.6)**Course outcome (Course Skill Set)**

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

CO1	Able to understand and design the solution to a problem using object-oriented programming concepts.
CO2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
CO3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
CO4	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.

Programming Assignments:

1. Write a C++ program to sort the elements in ascending and descending order.
2. Write a C++ program to find the sum of all the natural numbers from 1 to n.
3. Write a C++ program to swap 2 values by writing a function that uses call by reference technique.
4. Write a C++ program to demonstrate function overloading for the following prototypes.

add(int a, int b)

add(double a, double b)

5. Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle".Now, try calling the function by the object of each of these classes.

6. Suppose we have three classes Vehicle, FourWheeler, and Car. The class Vehicle is the base class, the class FourWheeler is derived from it and the class Car is derived from the class FourWheeler. Class Vehicle has a method 'vehicle' that prints 'I am a vehicle', class FourWheeler has a method 'fourWheeler' that prints 'I have four wheels', and class Car has a method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods.

So, if we invoke the methods in this order, car(), fourWheeler(), and vehicle(), then the output will be

I am a car

I have four wheels

I am a vehicle

Write a C++ program to demonstrate multilevel inheritance using this.

7. Write a C++ program to create a text file, check file created or not, if created it will write some text into the file and then read the text from the file.

8. Write a C++ program to write and read time in/from binary file using fstream

9. Write a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception.

10. Write a C++ program function which handles array of bounds exception using C++.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component **20 Marks**.

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totaling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to **30 marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.

- The laboratory test (**duration 03 hours**) at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for **20 marks**.

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE):

SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Textbooks

1. Bhushan Trivedi, “Programming with ANSI C++”, Oxford Press, Second Edition, 2012.
2. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.

Web links and Video Lectures (e-Resources):

Weblinks and Video Lectures (e-Resources):

1. Basics of C++ - <https://www.youtube.com/watch?v=BCIS40yzssA>
2. Functions of C++ - <https://www.youtube.com/watch?v=p8ehAjZWjPw>

Tutorial Link:

1. https://www.w3schools.com/cpp/cpp_intro.asp
2. <https://www.edx.org/course/introduction-to-c-3>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Assign small tasks to Develop and demonstrate using C++

COs and POs Mapping (Individual teacher has to fill up)

COs	POs						
	1	2	3	4	5	6	7
CO1							
CO2							
CO3							
CO4							

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Course Title:	Principles of Programming using C	
Course Code:	BPOPS103/203	CIE Marks 50
Course Type (Theory/Practical /Integrated)	Integrated	SEE Marks 50
		Total Marks 100
Teaching Hours/Week (L:T:P: S)	2:0:2	Exam Hours 3+2
Total Hours of Pedagogy	40 hours	Credits 03
	<p>Course Objectives:</p> <p>CLO 1. Elucidate the basic architecture and functionalities of a Computer</p> <p>CLO 2. Apply programming constructs of C language to solve the real-world problems</p> <p>CLO 3. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems</p> <p>CLO 4. Design and Develop Solutions to problems using structured programming constructs such as functions and procedures</p>	
	<p>Teaching-Learning Process (General Instructions)</p> <p>These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes. Use of Video/Animation to explain functioning of various concepts. Encourage collaborative (Group Learning) Learning in the class. Ask at least three HOT (Higher order Thinking) questions in the class, which promote critical thinking. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it. Introduce Topics in manifold representations. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them. Discuss how every concept can be applied to the real world - and when that's possible, it helps to improve the students' understanding. Use https://pythontutor.com/visualize.html#mode=edit in order to visualize the operations of C Programs 	
	Module-1 (6 Hours of Pedagogy)	
	<p>Introduction to C: Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C,</p> <p>Textbook: Chapter 1.1-1.9, 2.1-2.2, 8.1 - 8.6 ,9.1-9.14</p>	
Teaching-Learning Process	Chalk and talk method/PowerPoint Presentation/ Web Content: https://tinyurl.com/4xmrexre	

	Module-2 (6 Hours of Pedagogy)	
	Operators in C, Type conversion and typecasting. Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement. Textbook: Chapter 9.15-9.16, 10.1-10.6	
Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation	
	Module-3 (8 Hours of Pedagogy)	
	Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays, applications of arrays. Textbook: Chapter 11.1-11.10, 12.1-12.10,12.12	
Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation	
	Module-4 (6 Hours of Pedagogy)	
	Strings and Pointers: Introduction, string taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings. Pointers: Introduction to pointers, declaring pointer variables, Types of pointers, Passing arguments to functions using pointers Textbook: Chapter 13.1-13.6, 14-14.7	
Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation	
	Module-5 (6 Hours of Pedagogy)	
	Structure, Union, and Enumerated Data Type: Introduction, structures and functions, Unions, unions inside structures, Enumerated data type. Files: Introduction to files, using files in C, reading and writing data files. , Detecting end of file Textbook: Chapter 15.1 – 15.10, 16.1-16.5	
Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation	
CourseOutcomes(CourseSkillSet)		
Attheendofthecoursethestudentwillbeableto:		
CO1. Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.		
CO 2. Apply programming constructs of C language to solve the real world problem		
CO 3.Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting		
CO 4.Explore user-defined data structures like structures, unions and pointers in implementing solutions		

CO5.Design and Develop Solutions to problems using modular programming constructs using functions

Programming Assignments

- 1 Simulation of a SimpleCalculator.
- 2 Compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
- 3 An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges.
4. Write a C Program to display the following by reading the number of rows as input,

```

          1
        1 2 1
      1 2 3 2 1
    1 2 3 4 3 2 1
    -----
    nth row

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- 5 Implement Binary Search on Integers.
- 6 Implement Matrix multiplication and validate the rules of multiplication.
- 7 Compute $\sin(x)/\cos(x)$ using Taylor series approximation. Compare your result with the built-in library function. Print both the results with appropriate inferences.
- 8 Sort the given set of N numbers using Bubble sort.
- 9 Write functions to implement string operations such as compare, concatenate, and find string length. Use the parameter passing techniques.
- 10 Implement structures to read, write and compute average- marks of the students, list the students scoring above and below the average marks for a class of N students.
- 11 Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.
12. Write a C program to copy a text file to another, read both the input file name and target file name.

Note:

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Students can pick one experiment from the questions lot with equal choice to all the students in a batch. Student should develop an algorithm, program, execute and demonstrate the results with appropriate output for the given problem.

Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

The duration of SEE is 02 hours

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component **20 Marks**.

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totaling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to **30 marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the

continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.

- The laboratory test (**duration 03 hours**) at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks**.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for **20 marks**.

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
3. The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:

Textbooks

1. Computer fundamentals and programming in c, "Reema Thareja", Oxford University, Second edition, 2017.

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. <https://nptel.ac.in/courses/106/105/106105171/> MOOC courses can be adopted for more clarity in understanding the topics and verities of problem solving methods.

3. <https://tinyurl.com/4xmrexre>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars