DAV University, Jalandhar

FACULTY OF SCIENCE

Course Scheme & Syllabus
For
Bachelor of Science in Computer Science
(Hons.)

(As per NEP-2020)
Batch-2023 &onwards

(As per Choice Based Credit System)
1st TO 8th SEMESTER

DAV University, Jalandhar

Introductory Note of the Programme

The BSc program is designed to equip you with the knowledge and skills necessary to thrive in the rapidly evolving field of information technology, physics and mathematics. Over the course of this program, you will explore various aspects of computer science, including programming languages, database management, software development, networking, web development, and much more. Our curriculum is carefully crafted to strike a balance between theoretical knowledge and practical application, ensuring that you not only grasp the fundamental concepts but also gain hands-on experience in solving real-world problems.

Program Educational Objectives (PEOs)

PEO-1. Work productively as successful Computer professionals in diverse career paths including supportive and leadership roles on multidisciplinary teams or be active in higher studies.

PEO-2. Communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavours, and practice their profession with high regard to ethical responsibilities.

PEO-3. Engage in life-long learning and to remain current in their profession to foster personal and organizational growth.

Programme Outcomes (POs)

PO-1: Apply mathematics and computing fundamental and domain concepts to find out the solution of defined problems and requirements. (Computational Knowledge)

PO-2: Use fundamental principle of Mathematics and Computing to identify, formulate research literature for solving complex problems, reaching appropriate solutions. (Problem Analysis)

PO-3: Understand to design, analyze and develop solutions and evaluate system components or processes to meet specific need for local, regional and global public health, societal, cultural, and environmental systems. (Design/Development of Solutions)

PO-4: Use expertise research-based knowledge and methods including skills for analysis and development of information to reach valid conclusions. (Conduct Investigations of Complex Computing Problems)

PO-5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. (Modern tool usage)

PO-6: Exhibiting ethics for regulations, responsibilities and norms in professional computing practices. (Professional Ethics)

PO-7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development (Environment and sustainability).

PO-8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice (Ethics).

PO-9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings (Individual and team work).

PO-10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions (Communication).

PO-11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments (Project management and finance).

PO-12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change (Life-long learning).

Program Specific Objectives (PSOs)

PSO-1: Analyze their abilities in systematic planning, developing, testing and executing complex computing and computer science in field of Physics, Mathematics, social media and Analytics, Web Application Development and Data Interpretations.

PSO-2: Apprise in-depth expertise and sustainable learning that contributes to multi-disciplinary creativity, permutation, modernization and study to address global interest.

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Mapping of PSOs with PEOs

PEOs→ / PSO↓	PEO 1	PEO 2	PEO 3
PSO1	Yes	-------	Yes
PSO2	--------	Yes	Yes

Mapping of POs with PEOs

PEOs→ / POs↓	PEO 1	PEO 2	PEO 3
PO1	Yes		Yes
PO2			Yes
PO3	Yes		Yes
PO4		Yes	
PO5	Yes	Yes	
PO6			Yes
PO7	Yes		Yes
PO8			
PO9		Yes	
PO10	Yes		Yes
PO11		Yes	
PO12	Yes	Yes	

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Scheme of Courses
Bachelor of Science (Computer Science)

Credit Details			
S.No.	**Course Category**	**Course Category Abbreviation**	**3-Yr B.C.A/… (Credits)**
1.1	Discipline Specific Courses-Core	DSC	65
1.2	Discipline Specific-Skill Enhancement Courses-Core	DS-SEC	00
1.3	Discipline Specific-Value Added Courses-Core	DS-VAC	
Total of Discipline Specific Core Courses			
2.1	Minor Courses	MC	24
OR			
2.2	Interdisciplinary Courses	IDC	00
3	Multidisciplinary Courses	MDC	11
4	Ability Enhancement Course- Common	AEC-C	08
5	Value Added Courses-Common	VAC-C	06
6.1	Skill Enhancement Courses- Common	SEC-C	08
6.2	Skill Enhancement Courses-Summer Internship	SEC-SI	04
Total of Skill Enhancement Courses			
Total Credits			**126**

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Scheme of Courses
Bachelor of Science (Hons.) (Computer Science)

Credit Details				
S.No.	**Course Category**	**Course Category Abbreviation**	**4-Yr B.C.A. (Hons.)/.. (Credits)**	**4-Yr B.C.A. (Hons/.. (Hons. with Res.) (Credits)**
1.1	Discipline Specific Courses-Core	DSC	88	76
1.2	Discipline Specific-Skill Enhancement Courses-Core	DS-SEC	04	04
1.3	Discipline Specific-Value Added Courses-Core	DS-VAC		
	Total of Discipline Specific Core Courses			
2.1	Minor Courses	MC	32	32
OR				
2.2	Interdisciplinary Courses	IDC	00	00
3	Multidisciplinary Courses	MDC	11	11
4	Ability Enhancement Course-Common	AEC-C	08	08
5	Value Added Courses-Common	VAC-C	06	06
6.1	Skill Enhancement Courses-Common	SEC-C	08	08
6.2	Skill Enhancement Courses-Summer Internship	SEC-SI	04	04
6.3	Skill Enhancement Courses-Research Project/Dissertation	SEC-RP	--	12
Total of Skill Enhancement Courses				
Total Credits			**161**	**160**

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Semester 1

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP103	Algorithm Design and Programming Using C	DSC	3	0	2	4
2	MAT171	Algebra	DSC	3	0	0	3
3	PHS101	Mechanics	DSC	3	0	2	4
4	XXXX	Multi-Disciplinary Course	MDC	3	0	0	3
5	XXXX	Ability-Enhancement Course	AEC-C	2	0	0	2
6	XXXX	Skill-Enhancement Course (common)	SEC-C	2	0	0	2
7	XXXX	Value-added Course	VAC-C	3	0	0	3
	Total						**21**

L- Lectures T- Tutorial P- Practical Cr.- Credits

Semester 2

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP104	Object Oriented Programming using C++	DSC	3	0	2	4
2	MAT172	Ordinary Differential Equations	DSC	3	0	0	3
3	PHS201	Vibrations and Waves	DSC	3	0	2	4
4	XXXX	Multi -Disciplinary Course	MDC	2	0	0	2
5	XXXX	Ability-Enhancement Course	AEC-C	2	0	0	2
6	XXXX	Skill-Enhancement Course (common)	SEC-C	3	0	0	3
7	XXXX	Value-added Course	VAC-C	2	1	0	3
	Total						**21**

L- Lectures T- Tutorial P- Practical Cr.- Credits

FIRST EXIT:

The students will be awarded "Undergraduate Certificate in Computer Science" after exit at this point, provided they secure 4 Credits in skill/work-based vocational courses or internship/apprenticeship for 4-6 weeks (with minimum 120 hours) during summer term.

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Semester 3

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP 203	Database Concepts	DSC	3	0	2	4
2	MAT	Real Analysis	DSC	3	0	0	3
3	PHS202	Digital Systems and Application	MC	3	0	2	4
4	XXXX	Multi -Disciplinary Course	MDC	3	0	0	3
5	XXXXX	Ability-Enhancement Course	AEC-C	2	0	0	2
6	XXXX	Skill-Enhancement Course (common)	SEC-C	3	0	0	3
	Total						**19**

L- Lectures T- Tutorial P- Practical Cr.- Credits

Semester 4

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP 206	Operating Systems	DSC	3	0	0	3
2	CSP 204	Data Structures	DSC	3	0	2	4
3	CSP 208	Computer Networks	DSC	3	0	2	4
4	MTH	Analytical Geometry	MC	3	0	0	3
5	PHY	Optics	MDC	3	0	0	3
6	PHY	Thermal and Statistical Physics	MC	3	0	2	4
7	XXXX	Ability-Enhancement Course	AEC-C	2	0	0	2
	Total						**21**

L- Lectures T- Tutorial P- Practical Cr.- Credits

SECOND EXIT:

The student will be awarded "Undergraduate Diploma in Computer Science" after exit at this point provided that he/she secure 4 Credits in skill/work based vocational courses or internship/apprenticeship for 4 – 6 weeks (with minimum 120 hours) offered during first year summer term or second year summer term.

NCC 3 credits are only earned by those students who are opted NCC

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Semester 5

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP 302	Programming in Python	DSC	3	0	2	4
2	CSP 304	Cyber Security	DSC	3	0	2	4
3	MTH	Number Theory	DSC	3	0	0	3
4	PHY	Quantum Physics	MC	3	0	2	4
5	MTH	Mechanics I	MC	3	0	0	3
6		Internships	SEC	0	0	8	4
	Total						**22**

L- Lectures T- Tutorial P- Practical Cr.- Credits

Semester 6

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP 311	Artificial Intelligence	DSC	3	0	0	3
2	CSP 314	Discrete Mathematics	DSC	3	0	0	3
3	CSP 312	Software Engineering	DSC	3	0	0	3
4	MTH	Mechanics II	MC	3	0	0	3
5	PHY	Particle Physics	DSC	3	0	0	3
6	PHY	Nuclear Physics	MC	2	0	2	3
	Total						**18**

L- Lectures T- Tutorial P- Practical Cr.- Credits

Note: If the Student get CGPA >= 7.5 then he/she will have to submit the Research Project with 12 Credit.

THIRD EXIT:

The student will be awarded "Bachelor of Science in Computer Science" degree after exit at this point.

NCC 3 credits are only earned by those students who are opted NCC

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Semester 7

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP405	Theory of Computer Science	**DSC**	4	0	0	**4**
2	CSP404	Advanced in Operating System	**DSC**	3	0	2	**4**
3	----------	----------	**DS-SEC**	4	0	0	**4**
4	CSP401	Research Methodology	**MC**	4	0	0	**4**
5	CSP402	Internet of Things	**DSC**	3	0	2	**4**
	Total						**20**

DS-SEC (Discipline Specific-Skill Enhancement Course-Core)-(Choose One)

S.No	Paper Code	Course Title	L	T	P	Cr
1	CSP406	Compiler Design	3	0	0	3
2	CSP407	Emerging Trends and Technology	3	0	0	3

L- Lectures T- Tutorial P- Practical Cr.- Credits

Semester 8

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP409	Mobile Computing	**DSC**	4	0	0	**4**
2	CSP411	Digital Image Processing	**DSC**	3	0	2	**4**
3	CSP410*	Major Project	**-------**	0	0	12	**6**
4	CSP412*	Cryptography and Network Security	**MC**	2	0	2	**3**
5	CSP316*	R Programming	**DSC**	3	0	2	**4**
	Total						**20**

L- Lectures T- Tutorial P- Practical Cr.- Credits

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- ***Those students are adopting the research project they are exempted these courses. (12 credit)**

S.No	Paper Code	Course Title	Course Category	L	T	P	Cr
1	CSP415	Research Project	**--------**	0	0	24	**12**
	Total						**12**

Note: If the Student get CGPA less than 7.5, then He/ She will have to submit the Research Project with 12 Credit.

FOURTH EXIT:

The student will be awarded "Bachelor of Science in Computer Science (Hons.)" degree after exit at this point.

List of Multi-disciplinary open elective courses at DAV University

Sr. No.	Course Name	Faculty/Department
1	Basics of Physics	Physics
2	Basics of Chemistry	Chemistry
3	Basics of Biology	Zoology & Botany
4	Introductory Biotechnology	Biotechnology
5	Introductory Microbiology	Microbiology
6	Functioning of the Human Body	Zoology
7	Introductory Botany	Botany
8	Business Management for Beginners	CBME
9	Fundamental of Mutual Funds	CBME
10	Economics for Beginners	CBME
11	Professional Communication	English
12	Fine Arts	Arts, Fine Arts & Performing Arts
13	Jyotish: 'Eye of the Veda'	Vedic Studies
14	Mathematical Statistics	Mathematics
15	Introductory Journalism	JMC
16	Professional Photography	JMC
17	Library Information Sciences	Library Sciences

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Common courses with credits

Ability-Enhancement Courses	**Cr.**	**Skill-Enhancement Courses**	**Cr.**	**Value-Added Courses**	**Cr.**
Personality Enhancement	1L+1P	Essentials of Entrepreneurship-Thinking and Action	2L+1P	Environmental Studies **(Mandatory)**	2L+1P
Personality Development	2P	Design Thinking	2P	Human Values and Ethics **(Mandatory)**	2L+1T
Behavioural & Life Skills	1L+1P	Design Thinking & Innovation	2L	Gender Sensitization	2L
Global Citizenship in Higher Education	2L	Data Analytics	2L+1P	Professional Ethics	2L
Communication Skills **(Mandatory)** **OR** Cambridge English-I **(Mandatory#)** & Cambridge English-II **(Mandatory#)** # *To be offered in two semesters*	1L+1P 1L+1P 1L+1P	Cyber Security	3 (2L+1P)	Sustainable Development	2L
		Digital Fluency	1L+1P	Green Technologies	2L
Health & Yoga	1L+1P	Fundamentals of Computer programming & IT(FCPIT)	2L	General Studies	2L
Technical Report Writing	2L	Python Programming	3 (2L+1P)	NSS	2 (1L+1P)
Leadership Management	2L	Disaster Preparedness and Planning	2L		
Therapeutic Yoga	1L+1P	Intellectual Property Rights	2L		
Creative & Critical Thinking	1L+1P	Apiculture	2P		
Community Engagement & Social Responsibility **(Mandatory)**	1L+1P	NCC*	3 (2L+1P)		

		LATEX	3 (1L+2P)		
		Programming with FORTRAN	3(2L+1P)		

Notes:

a. Due to the constraint on total number of credits to be restricted under 160 for four year UG programmes, the mandatory courses which may or may not fall under ability-enhancement, skill-enhancement (common) or value- added courses can be offered as non-credit course and the student will have to qualify (as Satisfactory/Unsatisfactory) these courses to secure minimum passing marks through the process of assessment as mandated by DAV University.

b. Minimum number of students feasible to run a common course (Ability- enhancement, Skill-enhancement (common) and Value-added) will be 20 students.

c. *Pre-requisite to opt NCC is that the student must be in possession of Certificate B or has appeared in B-certificate exam of NCC. NCC course shall run in two semesters of 3 credits (2L+1P) in each semester. Student who wishes to opt for NCC is required to study in two semesters of total 6 credits.

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Semester 1

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CSP103**						
Course Title	**Algorithm Design and Programming Using C**						
Course Outcomes	On the completion of the course the student will be able to CO1: To define the concept of problem solving and steps to solving problems in computer application are using algorithms, pseudo-codes and flowcharts & sequential, selection and repetition structure. CO2: To understand the Concept of fundamentals of programming & Control structure. CO3: Apply the concepts of Function, arrays, Structure & Union. CO4: Demonstrate the ability to write C programs using pointers and file handling.						
Examination Mode	Theory/ Practical/ Theory + Practical						
Assessment Tools	Written Quiz	Assignment/ Project Work	MSE	MTP	ESE	EPR	ABL/PBL
Weightage	10%	10%	25%	-	50%	-	5%
Syllabus							**CO Mapping**
Unit 1	**Fundamentals of algorithms and programming, Operations and Expressions & Control Structures**						CO1
•	Concept: Problem-solving, Problem-solving techniques (Trial & Error, Brainstorming, Divide & Conquer), Steps in problem solving (Define Problem, Analyze Problem, Explore Solution), Algorithms and Flowcharts (Definitions, Symbols), pseudo-codes.						
•	Character Set, Identifiers and Key Words, Data Types, Constants, Variables, Expressions, Statements, Symbolic Constants and Operators & its types.						
•	Single Character Input, Single Character Output, Entering Input Data More About Scan Functions, Writing Output Data, More About Print Functions, Gets and Puts Functions, Library functions.						
Unit 2	**Decision Making and Looping Statements & Array**						CO2
•	Introduction, Decision Making with If–Statement, If Else and Nested If, While And Do-While, For Loop, Jump Statements: Break, Continue, Go to, Switch Statement.						
•	Introduction to Arrays, Array Declaration, Single and Multidimensional Array, Memory Representation, Matrices, Strings, String Handling Functions.						
Unit 3	**Functions, Structure and Union**						CO3
•	Introduction To Functions, Function Declaration, Function Categories, Standard Functions, Parameters and Parameter Passing, Pass – By Value/ Reference, Recursion, Global and Local Variables, Storage Classes.						
•	Declaration of Structure, Accessing Structure Members, Structure Initialization, Arrays of Structure, Nested Structures, Unions.						
Unit 4	**Pointers, Files & Preprocessor Directives**						CO4

•	Introduction To Pointers, Address Operator and Pointers, Declaring and Initializing Pointers, Assignment through Pointers, Pointers and Arrays.	
•	Introduction, creating a Data File, Opening and Closing a Data File, Processing a Data File.	
•	Introduction and Use, Macros, Conditional Preprocessors, Header Files	
Text Book/s	1. Balagurusami E, Programming in ANSIC, New Delhi: Tata McGraw Hill, Fourth Edition (2010).	
Reference Book/s	1. Sprankle, M&J. Hubbard, *Problem solving and programming concepts,* 9th Edition. NJ: Prentice Hall, 2012. 2. Gaddis,T., *Starting out with programming logic and design*, 3rd Edition. Boston: Addison Wesley 2012. 3. Venit, S. &E. Drake, *Prelude to programming: Concepts and design*, 5th Edition. Boston: Addison Wesley, 2011. 4. R.G.Dromy. *How to Solve it by Computer*, 3rd Edition, New Delhi: Pearson Education, 2007. 5. Kanetkar Yashwant P, *Let us C*, New Delhi: BPB Publications, Seventh Edition (2007). 6. Kernighan & Richie, *The C Programming Language*, New Delhi: PHI Publication, Second Edition (2009).	

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In hours			
L	T	P	Credit
3	0	2	4

Course Code	**PHS101**							
Course Title	**Mechanics**							
Course Outcomes	CO1: To enable the students to understand different types of reference frames, GalileanTransformations, concept of collision and non-inertial systems. CO2: To enable the students to understand rotational dynamics and motion of a particleunder inverse square central forces, CO3: Students will gain information about Special theory relativity. They will be able tolearn concept of relativistic mass and some of its consequences. CO4: Students will be able to verify some of the concepts learnt in the theory courses. They will be trained in performing experiments of Mechanics.							
Examination Mode	Theory+ Practical							
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**-**	**5**	**-**	**25**	**-**	**35**	**25**
Syllabus								**CO Mapping**
Unit 1	**Fundamentals of Dynamics**							
	Fundamentals of Dynamics: Inertial frames; Galilean transformations; Galilean invariance. Centre of mass. Principle of conservation of momentum. Conservative and non- conservative forces. Potential Energy. Force as gradient of potential energy. Collisions: Elastic and inelastic collisions between particles. Centre of mass and laboratory frames. Various relations between lab and centre of mass frames. **Non-Inertial Systems:** Non-inertial frames and fictitious forces. Uniformly rotating frame, Centrifugal force, Coriolis force and its applications.							1
Unit 2	**Rotational Dynamics and Central force motion**							
	Rotational Dynamics: Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. **Central force motion:** Central forces, Law of conservation of angular momentum for central forces, Two-body problem and its reduction to equivalent one-body problem and its solution, Concept of effective potential energy and stability of orbits for central potentials of the form kr^n for n = 2 and -1 using energy diagram, discussion on trajectories for n= −2. Solution of Kepler's problem, Kepler's laws for planetary motion, orbit for artificial satellites							2
Unit 3	**Special Theory of Relativity**							

	Michelson-Morley Experiment and its outcome, Postulates of Special Theory of Relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, frequency and wave number, Relativistic addition of velocities, Variation of mass with velocity, Massless Particles, Mass-energy Equivalence, Transformation of Energy and Momentum.	3
Unit 4	**List of Experiments**	
	1. To determine the height of a building using a Sextant. 2. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity 3. To determine the Moment of Inertia of a Flywheel. 4. To determine the Modulus of Rigidity of a Wire by Maxwell's needle 5. To determine the elastic Constants of a wire by Searle's method. 6. To determine the value of g using Bar Pendulum. **7.** To determine the value of g using Kater's Pendulum.	
Text Books	**1. D. Kleppner, R.J. Kolenkow, An introduction to mechanics, New Delhi: McGraw-Hill, 1973.** **2. C.Kittel, W.Knight, et.al. Mechanics, Berkeley Physics, vol.1, New Delhi: Tata McGraw-Hill, 2007.** **3. Resnick, Halliday and Walker, Physics, 8/e. Wiley, 2008.** **8. D.S. Mathur, Mechanics, New Delhi: S. Chand and Company Limited, 2000.** **9. F.W Sears, M.W Zemansky, H.D Young, University Physics. 13/e, Addison Wesley, 1986.** **5. C.L. Arora, B.Sc. Practical Physics**	4
Reference Books	**1. G.R. Fowles and G.L. Cassiday, Analytical Mechanics, New Delhi: Cengage Learning, 2005.** **2. R. P. Feynman, R. B. Leighton, M. Sands, Feynman Lectures, Vol. I, Pearson Education, 2008.** **3. R. Resnick, Introduction to Special Relativity, John Wiley and Sons, 2005.** **4. R. L. Reese University Physics, Thomson Brooks/Cole, 2003.** **5. S. Panigrahi and B. Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd, 2015.**	

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In hours			
L	**T**	**P**	**Credit**
3	-	-	3

Course Code	MAT171						
Course Title	Algebra						
Course Outcomes	On the completion of the course the students will be able to **CO1**: understand System of homogeneous and non-homogeneous linear equations. **CO2**: understand rank of matrix and apply the Cayley Hamilton Theorem. **CO3**: find roots of complex number and learn Fundamental Theorem of Algebra. **CO4**: understand Evaluating roots of polynomials of third and fourth degree, basic notions of Discarte's rule of sign, sturm's process						
Examination Mode	Theory						
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**10**	**5**	**-**	**25**	**-**	**50**	**-**

Syllabus		**CO Mapping**
Unit 1	**Theory of system of linear equations**	
•	Review of system of linear equations	CO1
•	general theory of system of linear equations	CO1
•	Row and column rank of a matrix	CO1
•	System of homogeneous and non-homogeneous linear equations	CO1
Unit 2	**Rank of Matrix and Cayley Hamilton Theorem**	
•	Matrices and Rank of matrix	CO2
•	Inverse of matrix, Elementary Linear Transformations	CO2
•	Determinants and their properties, Cramer Rule	CO2
•	Cayley Hamilton Theorem	CO2
Unit 3	**Fundamental Theorem of Algebra**	
•	A deeper look at complex Numbers, taking roots of complex numbers	CO3
•	Quick review of operations on polynomials	CO3
•	Divisors and greatest common divisor	CO3
•	Roots of polynomials, Fundamental Theorem of Algebra, corollaries of Fundamental Theorem.	CO3
Unit 4	**Cubic and Biquadratic Polynomials**	
•	Evaluating roots of polynomials of third and fourth degree	CO4
•	Bounds of roots, Sturm's Theorem	CO4
•	Descarte's rule of signs	CO4
•	Approximation of Roots	CO4
Text Books	• A. Kurosh, Higher Algebra, MIR Moscow,1982 • Lipschutz, Seymour and Lipson, Marc *Schaum's Outline of Linear Algebra*, 3rd Edition, McGraw HillEducation, 2017.	

Reference Books	• Shanti Narayan and P. K. Mittal, A textbook of matrices, S.Chand and Company Limited, 2019. • Friedberg, S.H., A.J. Insel and L.E. Spence. *Linear Algebra*. Prentice Hall, 2003.	

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Semester - 2

In hours			
L	**T**	**P**	**Credit**
3	0	2	4

Course Code	**CSP104**						
Course Title	**Object Oriented Programming using C++**						
Course Outcomes	On the completion of the course the student will be able to CO1: Discuss the concepts of OOPs. Comparison with the previously developed languages. CO2: Developing the concepts of Classes and object by using real-world examples. CO3: Implement the concepts of Friend function and Inheritance. CO4: Developing the programs using the concept of virtual function and using the concept of file handling. CO5: Interaction with the IDE and help in understanding the concept of OOPs.						
Examination Mode	Theory/ Practical/ Theory + Practical						
Assessment Tools	Written Quiz	Assignment/ Project Work	MSE	MTP	ESE	EPR	ABL/PBL
Weightage	10%	10%	25%	-	50%	-	5%
Syllabus							**CO Mapping**
Unit 1	**Introduction to OOPS & Class Concepts**						CO1,5
•	Evolution Of OOP, OOP Features Of C++, Characteristics of Object Oriented Language – Objects, Classes, Inheritance, Reusability, User Defined Data Types, Polymorphism, Overloading, Comparison of C with C++.						
•	Class and Objects, Inline Functions, Static Data, Members and Member Functions, Constructors and Destructors.						
•	Dynamic Objects, Array of Pointers to Object, Pass By Value Vs. Pass By Reference, Local and Global Class, Nested and Empty Class, Pre-processor Directives, Namespace.						
Unit 2	**Console I/O &Operator Overloading**						CO2
•	Hierarchy of Console Stream Classes, Unformatted and Formatted I/O Operations, Manipulators						
•	Overloadable Operators, Overloading-Unary and Binary, Arithmetic and Relational Operators, Overloading Subscript, Array, Insertion, Extraction, New and Delete Operators.						
Unit 3	**Friend Function and Type Conversion & Inheritance**						CO3
•	Friend Function, Function Overloading, Overloading Operators through Friend Function						
•	Basic Type Conversion, Conversion Between Objects and Basic Types, Conversion Between Objects of Different Classes						
•	Derivation Rules, Different Forms of Inheritance, Roles of Constructors						

	and Destructors in Inheritance	
Unit 4	**Virtual Functions & File Handling**	CO4
•	Virtual Functions and Their Needs, Pure Virtual Function, Virtual Destructor, Virtual Derivation, Abstract Class.	
•	Hierarchy of File Stream Classes, Opening and Closing Files.	
•	File Modes, Testing for Errors, File Pointers and Their Manipulations, ASCII & Binary Files, Sequential and Random Access Files	
Text Book/s	1. Balaguruswami E, *Object Oriented Programming In C++*, New Delhi: Tata Mc Graw Hill,2006	
Reference Book/s	1. Stroustrup Bjarne, *The C++ Programming Language*, New Delhi: Addison-Wesley Professional,2000 2. Lafore Robert, *Object Oriented Programming in C++*. Delhi: Sams Publishing, 2000 3. Lippman,Tom Weiss, *C++ Primer*, New Delhi: Addison Wesley, 2005 4. Scildt Herbert, *C++ The Complete Reference*, New Delhi: Tata Mc Graw Hill, 2007	

DAV UNIVERSITY, JALANDHAR

In hours			
L	**T**	**P**	**Credit**
3	0	2	4

Course Code		**PHS 201**
Course Title		**Vibrations and Waves**
Course Outcomes		On the completion of the course the student will be able to **CO1:** Gain knowledge in simple harmonic motion in mechanical and electrical systems **CO2:** Understand the damping mechanism in simple harmonic motion **CO3:** Gain knowledge in forced and coupled mechanical and electrical oscillators **CO4:** Understanding of wave motion concepts and hands on training on the SHMexperiments and wave motion related practical
Examination Mode		Theory/ Practical/ Theory + Practical

Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	MSE	MSP	ESE	ESP
Weightage	**10**	**-**	**5**	**-**	**25**	**-**	**35**	**25**

Syllabus		**CO Mapping**
Unit 1	***Simple Harmonic motion***	CO1
	Hooke's law, Equation of Simple harmonic motion, Frequency, Amplitude, Displacement, Velocity, Acceleration, and phase differenceof SHM, Energy of a simple harmonic oscillator, Compound pendulum,Torsional pendulum, Kater's pendulum, Simple harmonic oscillationsin electrical system, Principle of Superposition Harmonic Oscillations, Superposition of Two Harmonic Motions of Same Frequency, Lissarjous figures and its applications, Anharmonic Oscillations.	
Unit 2	***Damped oscillations***	
	Damped simple harmonic motions in mechanical and electrical system, Decay of free vibrations due to damping, Differential equation of damped harmonic motion and its solution, Types of damping, Determination of damping coefficient of a damped vibrating system – Logarithmic decrement, Relaxation time, and Quality Factor, Forced Vibrations – Mechanical and Electrical Forced Oscillator, Transient andsteady state oscillations.	
Unit 3	***Forced oscillations***	CO3
	Forced Mechanical Oscillators - Displacement, Velocity and Acceleration, Variation of Displacement, Velocity and Acceleration with driving force frequency, Power supplied to Forced Oscillator by the driving force, Power dissipated against frictional force, Variation ofpower with driving force frequency, Quality factor, Amplification factor of forced oscillator Coupled Oscillations - Mechanical and Electrical Coupled Oscillators, Stiffness Coupled Oscillators, Potential energy of coupled pendulums, Equation of motion of two	

	coupled pendulums, Inductive coupling of electrical oscillators.	
Unit 4	***Wave motion and practicals***	CO4
	Types of Waves - Longitudinal and Transverse Waves, Characteristics of Wave Motion, Differential Equation of Wave Motion, Equation of a Progressive Simple Harmonic Waves, Energy in Progressive waves, Velocities of Wave motion – Particle, Wave, Group Velocities, Relation between Particle Velocity and Wave Velocity, Velocity of Transverse Waves, Characteristics impedance of string, Reflection and Transmission of Waves on a string at a Boundary, Reflection and Transmission Coefficients – Amplitude and Energy, Stationary Waves and Waves on a string of fixed length, Nodes and Anti-nodes, Energy of a Vibrating String 1. To determine the frequency of a tuning fork using a sonometer. 2. To verify the laws of transverse vibrations of stretched strings usinga sonometer 3. To determine the frequency of AC mains using a sonometer and anelectromagnet. 4. To find the velocity of sound in the material of the given rod with a Kundt's tube. 5. To measure the logarithmic decrement, coefficient of damping, relaxation time and quality factor of a simple damped pendulum.	
Text Books	1. S P Puri, Vibrations and Waves, Macmillan India Ltd.,2004. 2. H. J. Pain, Physics of Vibrations and Waves, John Wiley and Sons, 2013.	
Reference Book/s	1. N.K. Bajaj, Physics of Waves and Oscillations, Tata McGraw Hill, 1998 2. Vibration and Waves by S Chand Publishers	

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In hours			
L	**T**	**P**	**Credit**
3	-	-	3

Course Code	MAT172						
Course Title	Ordinary Differential Equations						
Course Outcomes	On the completion of the course the student will be able to **CO1**: find solutions of boundary value problems and understand Basic Existence Theorem. **CO2**: check the exactness of differential equation $Mdx + Ndy = 0$, finding integrating factors of non-exact differential equation. **CO3**: find solutions of Linear differential equation and understand differential operators **CO4**: apply method of Undetermined coefficients, variation of parameters to find solution of non-homogeneous equation.						
Examination Mode	Theory						
Assessment Tools	**Quiz**	**Assignment**	**ABL/PBL**	**Lab Performance**	**MSE**	**MSP**	**ESE**	**ESP**
Weightage	**10**	**10**	**5**	**-**	**25**	**-**	**50**	**-**
Syllabus								**CO Mapping**
Unit 1	**Boundary Value Problems**							
•	Origin of Differential equations, Basic definitions							CO1
•	Family of Solutions, Geometric Interpretation							CO1
•	Boundary Value Problem							CO1
•	Basic Existence Theorem (Statement)							CO1
Unit 2	**Exact Differential Equations**							
•	Equations of Order One, Separation of Variables							CO2
•	Exact Equations, Linear Equations							CO2
•	Integrating Factors							CO2
•	Bernoulli's equation, Elementary applications							CO2
Unit 3	**LDE with constant coefficients**							
•	General Linear equation: General Solutions, Linear independence of solutions							CO3
•	Differential operators							CO3
•	Linear equations with constant coefficients							CO3
•	Auxiliary equations							CO3
Unit 4	**Variation of Parameter method and Non-linear equation**							
•	Non-Homogeneous equation: Method of Undetermined coefficients							CO4
•	Variation of Parameter Method							CO4
•	Non-Linear Equations							CO4
Text Books	• EARL D. RAINVILLE AND P. E. BENEDIET, *Elementary differential equations*, Seventh Edition, Macmillian, Publishing Company, 1989.							

Reference Books	• S. L. ROSS, *Differential Equations*, 3rd ed., John Wiley and Sons, India 2004.	

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Course Title: Object Oriented Programming Structures Laboratory
Course Code: CSP104

L	T	P	Credits	Marks
0	0	2	1	50

- Implementation of OOP concepts using C++
- Write program in 'C++' language
- Using input and output statements
- Using control statements.
- Using functions.
- Using array
- Using Classes and implementation of Constructor and Destructor.
- Using files.
- Using OOP's Concepts (Inheritance, Polymorphism, Encapsulation, Friend and Static Functions, Exception Handling)