



**ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY  
COURSE STRUCTURE AND SYLLABUS**

**FOR**


**BACHELOR OF COMPUTER APPLICATION (BCA) PROGRAMME  
(4 YEARS)**


**BASED ON NATIONAL EDUCATION POLICY 2020**


**w.e.f**

**AY: 2024 - 25**

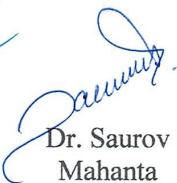
**DRAFT v.1**

  
Dr. Subhrajyoti  
Bordoloi

  
Dr. Amrita Bose  
Paul

  
Dr. Y. Jayanta  
Singh

  
Imopishak  
Thingom

  
Dr. Saurov  
Mahanta

## 1. Credits and Types of Courses

### A. Discipline Specific Courses(DSC):

A discipline specific course (DSC) is a mandatory course that a student must take as part of the program. *Each DSC carries 4 or 5 credits. Each DSC without a practical carries 4 credits (3-1-0 or 4-0-0) and DSC with practical carries 5 credits (3-0-4).*

### B. Discipline Specific Elective(DSE):

Discipline Specific Elective (DSE) courses are credit courses that students can choose from within the discipline. *Each DSE carries 4 or 5 credits. DSE without a practical carries 4 credits (3-1-0 or 4-0-0) and DSE with practical carries 5 credits (3-0-4).*

### C. Ability Enhancement Courses (AEC)

These courses focus on developing language and communication skills, with an emphasis on both a Modern Indian Language (MIL) and English language proficiency. *Each AEC carries 4 credits.*

### D. Skills Enhancement Courses (SEC)

These courses aim to impart practical skills, hands-on training, and soft skills to enhance students' employability. *Each SEC has 4 credits(3-1-0,3-0-4)*

### E. Value-Added Course (VAC)

A value-added course (VAC) aims to improve a student's skills, knowledge, and employability beyond their regular curriculum. *Each VAC carries 3 credits.*

## 2. Course Levels and Duration

A. Undergraduate / Three or Four years/6 or 8 Semesters with multiple entry and exit. The following option will be made available to the students joining the BCA Program:

a. **One Year: Undergraduate Certificate in Computer Application**

Students who decide to leave after completing their first year and have obtained a minimum of 40 credits will receive an Undergraduate Certificate *if, additionally, they complete a vocational course/Skilling Course worth 4 credits during the first year.* These students have the option to rejoin the degree program within three years and finish it within a maximum period of seven years.

b. **Two years: Under Graduate Diploma in Computer Application**

Students who choose to exit after completing their second year and have earned 82 credits will be granted the Undergraduate Diploma *if, along with this, they complete a vocational course/ Skilling course worth 4 credits during the second year.* They are also allowed to rejoin within three years and complete the degree program within a

maximum period of seven years.

c. **Three years: Bachelor in Computer Application (BCA)**

Those opting for a 3-year undergraduate program will receive the Undergraduate Degree in the Major discipline upon successful completion of three years, securing 127 credits, and meeting the minimum credit requirements.

d. **Four years: Bachelor in Computer Application with Honours: BCA (Honours)** A four-year Undergraduate Honors degree in computer applications will be conferred upon those who complete a four-year degree program with 167 credits and fulfill the credit requirements.

e. **Four years: Bachelor in Computer Application Honours with Research: BCA(Honours with Research)**

Students achieving 75% marks or above in the first six semesters and wishing to pursue research at the undergraduate level can opt for a research stream in the fourth year. They will undertake a research project or dissertation under the guidance of a faculty member of the University/College, focusing on the major discipline. Upon completing 167 credits, including 20 credits from the research project/dissertation, they will be awarded the degree in Computer Application (Honors with Research).

### 3. Program Outcomes

**PO1:** Provide a strong foundation in computers and its applications.

**PO2:** Provide the students with requisite technical and problem solving skills.

**PO3:** Identify, formulate, research literature and solve computing problems using principles of mathematics, computer sciences and other domain disciplines

**PO4:** Ability to learn new technologies for upgrading their skills

**PO4:** Acquiring new skills needed to be employable as per demands

# COURSE STRUCTURE AND SYLLABUS

## SEMESTER – I SYLLABUS STRUCTURE

Sl. No.	Course Code	Course Title	L-T-P	Credits
		<b>3 WEEKS COMPULSORY INDUCTION PROGRAM</b>		
1	DSC-101	Computer Fundamental and ICT Hardware	3-1-0	4
2	AEC-101	Communicative English	4-0-0	4
3	DSC-102	Introduction to C Programming	3-0-0	3
4	DSC-103	Mathematics-I	3-1-0	4
5	VAC-101	Indian Knowledge System	3-0-0	3
6	DSC-102P	Introduction to C Programming Lab	0-0-4	2
<b>TOTAL</b>				<b>20</b>

## SEMESTER – II SYLLABUS STRUCTURE

Sl.No.	Course Code	Course Title	L-T-P	Credits
1	DSC-201	Data Structure and Algorithm	3-0-0	3
2	DSC-202	Mathematics-II	3-1-0	4
3	DSC-203	Digital Logic	3-1-0	4
4	DSC-201P	Data Structure and Algorithm Lab	0-0-4	2
5	AEC-201	Professional Communication	4-0-0	4
6	VAC-201	Constitution of India	3-0-0	3
<b>TOTAL</b>				<b>20</b>

- I. An **Under Graduate Certificate In Computer Application** will be awarded, if a student wishes to exit at the end of First year.
- II. **Exit Criteria after First Year of BCA Programme**  
The students shall have an option to exit after 1st year of Computer Application Program and will be awarded with a UG Certificate in Computer Application. Students on exit have to compulsorily complete additional 04 Credits either in a Skill based subject or work based Vocational Course offered during summer term or Internship/Apprenticeship / Social Responsibility & Community Engagement – encompassing community engagement with an NGO after the second semester of minimum 08 weeks of duration as decided by the respective University / Admitting Body. The exiting students will clear the subject / submit the Internship Report as per the University schedule.
- III. **Re-entry Criteria in to Second Year (Third Semester)**

The student who takes an exit after one year with an award of certificate may be allowed to re-enter in to Third Semester for completion of the BCA Program as per the respective University /Admitting Body schedule after earning requisite credits in the First year.

### SEMESTER -III SYLLABUS STRUCTURE

Sl.No.	Course Code	Course Title	L-T-P	Credits
1	DSC-301	Computer Architecture and Organization	3-1-0	4
2	DSC-302	Database Management System	3-0-0	3
3	DSC-303	Object Oriented Programming in Java	3-0-0	3
4	VAC-301	Environmental science	3-0-0	3
5	DSC-302P	Database Management System Lab	0-0-4	2
6	DSC-303P	Object Oriented Programming in Java Lab	0-0-4	2
7	SEC-301	Linux Environment	3-0-0	3
8	SEC-301P	Linux Environment Lab	0-0-2	1
<b>TOTAL</b>				<b>21</b>

### SEMESTER - IV SYLLABUS STRUCTURE

Sl.No.	Course Code	Course Title	L-T-P	C
1	DSC-401	Software Engineering	4-0-0	4
2	DSC-402	Web Technology	3-0-0	3
3	DSC-403	Theory of computer science	4-0-0	4
4	DSC-404	Computer Networks	3-1-0	4
5	DSC-402P	Web Technology lab	0-0-4	2
6	SEC-401	Programing with Python	3-0-0	3
7	SEC-401P	Programing with Python Lab	0-0-2	1
<b>TOTAL</b>				<b>21</b>

**Note:**

1. At the end of the Fourth Semester every student shall undergo Summer Training /Internship /Capstone for Eight Weeks in the industry/Research or Academic Institute. This component will be evaluated during the fifth

semester.

**I. An Under Graduate Diploma In Computer Application** will be awarded, if a student wishes to exit at the end of Second year.

**II. Exit Criteria after Second Year of BCA Programme**

The students shall have an option to exit after 2<sup>nd</sup> year of Computer Application Program and will be awarded with a UG Diploma in Computer Application. Students on exit have to compulsorily complete additional 04 Credits either in a Skill based subject or work based Vocational Course offered during summer term or Internship/Apprenticeship / Social Responsibility & Community Engagement – encompassing community engagement with an NGO / Capstone Project after the fourth semester of minimum 8 weeks of duration as decided by the respective University / Admitting Body. The exiting students will clear the subject / submit the Internship Report as per the University / Admitting Body schedule.

**III. Re-entry Criteria in to Third Year (Fifth Semester)**

The student who takes an exit after second year with an award of Diploma may be allowed to re-enter in to fifth Semester for completion of the BCA Program as per the respective University / Admitting Body schedule after earning requisite credits in the Second year.

**SEMESTER - V SYLLABUS STRUCTURE**

Sl.No.	Course Code	Course Title	L-T-P	Credits
1	DSC-501	Operating System	3-1-0	4
2	DSC-502	Network Security and Cryptography	3-1-0	4
3	DSC-503	Design and Analysis of Algorithm	3-1-0	4
4	SEC-401	Programming with C++	3-0-0	3
5	SEC-401P	Programming with C++ Lab	0-0-2	1
6	INT-505	Internship –I*	-	4
7	PRJ - 506	Major Project -PHASE-I [proposal & initial investigations] ( Partial evaluation and Final evaluation in sixth semester) -		2
<b>TOTAL</b>				<b>22</b>

\*Students will go for Summer Training / Internship /Capstone Project after the 4<sup>th</sup> semester for 4 weeks which will be evaluated in the 5<sup>th</sup> semester.

### SEMESTER VI SYLLABUS STRUCTURE

Sl.No.	Course Code	Course Title	L-T-P	Credits
1	DSC-601	Artificial Intelligence	3-1-0	4
2	DSC-602	Machine Learning	3-0-0	3
3	DSC-602P	Machine Learning Lab	0-0-4	2
4	DSE -601	Discipline Specific Elective	3-1-0	4
5	PRJ - 601	Major Project PHASE-II [Initiated in 5th Semester]	-	10
<b>TOTAL</b>				<b>23</b>

**Discipline Specific Elective:**

Sl.No.	Course Title
1	Cloud Computing
2	Introduction To Data Science
	Any other as approved by university

- I. **Bachelor in Computer Application Degree** will be awarded, if a student wishes to exit at the end of Third year.
- II. **Exit Criteria after Third Year of BCA Programme:** The students shall have an option to exit after 3<sup>rd</sup> year of Computer Application Program and will be awarded with a Bachelor's in Computer Application.
- III. **Re-entry Criteria in to Fourth Year (Seventh Semester) :** The student who takes an exit after third year with an award of BCA may be allowed to re-enter in to Seventh Semester for completion of the BCA (Honours) or BCA (Honours with Research) Program as per the respective University / Admitting Body schedule after earning requisite credits in the Third year.
- IV. Minimum eligibility criteria for opting the course in the fourth year will be as follows:
  - BCA (Honours with Research): Minimum 75% marks or equivalent CGPA in BCA Degree up to Sixth Semester.
  - For BCA (Honours): BCA Degree

**SEMESTER - VII SYLLABUS STRUCTURE (COMPUTER APPLICATION  
(Honours))**

<b>S.No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L-T-P</b>	<b>Credit</b>
1	DSE-701	Discipline Specific Electives	3-1-0	4
2	DSE-702	Discipline Specific Electives	3-1-0	4
3	DSE-703	Discipline Specific Electives	3-1-0	4
6	PRJ- 701	Dissertation work-PHASE-I [Partial Evaluation & Final evaluation in Eight semester]	-	4
7	INT-701	Internship -II	-	4
<b>TOTAL</b>				<b>20</b>

**Discipline Specific Electives:**

<b>Sl.No.</b>	<b>Course Title</b>
1	Data Mining
2	Computer Graphics
3	Software Testing
4	Mobile Computing
5	Agile Software Development
	Any other as approved by university



**SEMESTER -VIII SYLLABUS STRUCTURE - (COMPUTER APPLICATION (Honours))**

S.No	Course Code	Course Title	L-T-P	Credit
1	DSE-801	Discipline Specific Electives	4-0-0	4
2	DSE-802	Discipline Specific Electives	4-0-0	4
3	DSE-803	Discipline Specific Electives	4-0-0	4
4	PRJ-801	Dissertation work-PHASE-II [Started in Seventh semester]		8
<b>TOTAL</b>				20

**Discipline Specific Electives**

1	Natural Language Processing
2	Quantum Computing
3	Neural Networks and Deep Learning
4	Internet of Things
5	Image Processing
6	Big Data Analytics
	Any other as approved by the university

**SEMESTER VII - (COMPUTER APPLICATION (Honours with Research))**

S.No.	Course Code	Course Title	L-T-P	Credit
1	DSC-701	Research Methodologies	4-0-0	4
2	DSC-702	Discipline Specific Electives	4-0-0	4
3	DSE-701	Discipline Specific Electives	4-0-0	4
4	DSE-702	Discipline Specific Electives	4-0-0	4
		Research Internship Report	-	4

		and Viva -Voce		
<b>TOTAL</b>				<b>20</b>

### Discipline Specific Electives

Sl.No.	Course Title
1	Data Mining
2	Computer Graphics
3	Software Testing
4	Mobile Computing
5	Agile Software Development

### SEMESTER - VIII SYLLABUS (COMPUTER APPLICATION (Honours with Research))

S.No	Course Code	Course Title	Category	L-T-P	Credit
1	PRJ-801	Dissertation (For Research Track)*			
<b>TOTAL</b>					<b>20</b>

\*The Dissertation work will start from the beginning of fourth year of BCA (Honours with Research) Program. Students of Fourth Year shall be assessed for Project Work and Research Internship Report and Viva -Voce and Dissertation (For Research Track).

## SUMMARY

SEMESTER	L-T-P	Credit	Degree/Diploma/Certificate on Exit	Re-Entry
1	16-1-4	20		
2	16-2-4	20	<p style="text-align: center;"><b>[40+4 Credits]</b></p> <p><b>UG Certificate in Computer Application</b>  <i>on completion of additional vocational course/skilling course worth 4 credits during the first year</i></p>	<i>Can rejoin the degree program within three years and finish it within a maximum period of seven years.</i>
3	12-0-10	21		
4	14-1-6	21	<p style="text-align: center;"><b>[82+4 Credits]</b></p> <p><b>UG Diploma in Computer Application</b>  <i>on completion of vocational course/skilling course worth 4 credits during the second year</i></p>	<i>Can rejoin the degree program within three years and complete the degree program within a maximum Period of seven years.</i>
5	12-3-2	22		
6	9-1-4	23	<p><b>I. Undergraduate Degree in Computer Applications/ Bachelor of Computer Application.</b>  <b>(BCA)</b>  <b>(127 Credits)</b></p>	Can re-enter in to Seventh Semester for completion of the BCA (Honours) or BCA (Honours with Research) Program as per the respective University / Admitting Body schedule after earning requisite credits in the Third year.
7	12-0-0	20		
8	12-0-0	20	<b>BCA(Honours) [127+40=167 Credits]</b>	
7		20		
8		20	<b>BCA(Honours with Research)[ 127+40=167 Credits]</b>	



## DETAILED SYLLABUS

### SEMESTER – I

**Course Code : DSC-101**

**Course Title: Computer Fundamental and ICT Hardware**

**Course Outcome:** After learning the course the students should be able to:

- Explain about the fundamentals of computers.
- Understand how information is represented in computers.
- Explain different components inside a computer like SMPS, RAM, NIC, CPU, Hard Disk etc.
- Understand Computer Networking and its components

**Detailed Syllabus:**

UNIT	Content	Weeks
1	Evolution of Computer system, Classification of Computer, Modern Computer, Hardware and Software. Major components of a Digital Computer (A brief introduction of CPU, Main memory, Secondary memory devices and I/O devices) Keyboard, monitor, mouse, printers, Secondary storage devices (floppy disks, hard disks and optical disks), backup system and why it is needed.	2
2	Number System: Representation of numbers (only a brief introduction to be given) and characters in computer. Binary, Hexadecimal, Octal, BCD, ASCII. EDCDIC and Gray codes. Conversion of bases. Representation of signed integers, Sign and magnitude, 1's complement and 2's complement representation. Arithmetic operations using 2's complement representation and conditions for overflow/underflow and its detection.	3
3	Assembler, Compiler, Interpreter, Linker and Loader. Definition and concepts of algorithm and its different implementations- pseudo code, flowchart and Computer programs.	2

4	Hard Disk Drive: logical structure and file system, FAT, NTFS. Hard disk tools: Disk cleanup, error checking, de fragmentation, scanning for virus, formatting, installing additional HDD.	2
5	Optical Media, CDROM, theory of operation, drive speed, buffer, cache, CD-r, CD-RW, DVD ROM, DVD technology, preventive maintenance for DVD and CD drives, New Technologies. Driver installation, Writing and cleaning CD and DVD.	2
6	Processor: Intel processor family. Latest trends in processor, Motherboard, Sockets and slots, power connectors. Peripheral connectors. Bus slots, USB, pin connectors. Different kinds of motherboards. RAM, different kinds of RAM. RAM up gradation. Cache and Virtual Memory concept.	2
7	SMPS. BIOS. Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.	2
<b>Books</b>	1. Anita Goel, <b>Computer Fundamentals</b> , Pearson, 2010.	
	2. <b>Comdex: Hardware and Networking Course Kit</b> , DreamTech press.	
	3. V. Rajaraman, Neeharika Adabala, <b>Fundamentals of Computers</b> , PHI, IEEE 6th Edition	
	4. Ron Gilster, <b>PC hardware: A beginners Guide</b> , Tata McGraw Hill.	
	5. E. Balaguruswamy, <b>Computer Fundamentals and C Programming</b> , Tata McGraw Hill.	

**Course Code : AEC-101**

**Course Title: Communicative English**

**Course Outcome:**

- After completing this course students will be able to:
- Communicate in English language.
- Develop skills in written communications.
- Develop other soft skills like personal interviews.
- Enhance the ability to be more elaborative in their writing skills.
- Build their confidence, overcome untoward situations and prepare them for future endeavors.
- Develop their personality to be a professional in the 21<sup>st</sup> century.
- Improve their ways of communication through various forms and conveying the right message thereby making it effective.
- Develop interaction with their batch mates, friends and teachers.

**Detailed Syllabus:**

UNIT	PARA	Content	Weeks
1		<b>Concept and fundamentals of communication skills</b> Scope and Meaning of communication; essentials of good communication- listening and reading skills, verbal and non-verbal communications, gestures and body language, formal	3
2		<b>Oral Communication</b> Mechanisms of effective oral communication-how to speak a language clearly, fluently and naturally; pronunciation- stress and intonation; everyday conversation and chat;group discussion and interviews; public speaking.	2
3		<b>Written communication</b> Mechanisms of effective written communication - punctuation, sequencing of ideas, building paragraph/body, a good introduction and conclusion; word buildings; writing letters for different occasions; report/ summary/ gist writing etc..	3
4		<b>Business communication in English</b> :Extensive oral and written examples of various kind of Business communication <b>English in the field of science &amp; technology</b> : Extensive oral and written examples of various kinds of English usedin the field of science and technology	3
5		<b>Personal Interview Marks</b> : An external expert appointed by the University, the head of the concerned department and the course in-charge of the institution will constitute an expert panel and students will be required to appear before them for viva voce to give evidence of their acquired communicative skills.	2
6		<b>Home assignment and group discussion</b> : Home assignments and group discussion will have to be arranged by the teacher in charge of the course and from properly maintained records of such assignments and group discussion, one internal committee formed by the HOD of the CS/IT/CA department of the College concerned will finalize the marks..	2
Books:	1.	<b>Strengthen your Writing</b> : V. R. Narayanaswami (Orient Longman)	
	2.	<b>Everyday Dialogues in English</b> : Robert J. Dixon (Prentice Hall of India)	
	3.	<b>Spoken English</b> : V. Sasikumar & P. V. Dhamija (Tata McGraw-Hill Publishing Ltd.)	
	4.	<b>C. S. Communication</b> : Rayudu (Himalaya Publishing House)	
	5.	<b>Oxford AdvancedLearner’s Dictionary Or Cambridge AdvancedLearner’s</b>	

Course Code : DSC-102

Course Title : Introduction to C programming

**Course Outcome:**

After completing this course the student will be able to

- Understand the concept of programming
- Use algorithm and flowchart in writing a program
- Understand features and structure of a C program
- Use operator, expressions, conditional constructs and looping for developing a program.
- Understand and Use pointers
- Perform file operations using C.

**Detailed Syllabus:**

UNIT	PARA	Content	Weeks
1		<b>Overr view of C</b> Importance of C, sample C program, C program structure, executing C program. Variables, Data Types, Constants: integer constant, real constant, character constant, string constant; Character set, C tokens, keywords and identifiers, variables declaration, Assigning values to variables--- Assignment statement, declaring a variable as	3
2		<b>Operators and Expression</b> Categories of operator- Arithmetic, Relational, logical, assignment, increment, decrement, conditional, bitwise and special operators; arithmetic expressions, precedence and associativity of operators,	2
3		<b>Managing Input and Output Operators</b> Reading and writing a character, formatted input, formatted output.	2
4		<b>Decision Making and Branching Statement</b> <i>if</i> statement, <i>if.....else</i> statement, nested <i>if.... else</i> statement , <i>switch....case</i> statement, <i>goto</i> statement. <b>Decision Making and Looping</b> Definition of loop, categories of loops, <i>for</i> loop <i>while</i> loop, <i>do-while</i> loop, <i>break</i> statement, <i>continue</i> statement	2
5		<b>Arrays</b> Declaration and accessing of one & two-dimensional arrays, initializing t w o -dimensional arrays, multidimensional arrays.. <b>Functions</b> The form of C functions, Return values and types, return statement,	2

6		<b>Structures and Unions &amp; Preprocessors</b> Defining, giving values to members, initialization and comparison of structure variables, array of structure, array within structure, structure within structure, structures and functions, unions. Macro substitution, file inclusion.	2
7		<b>Pointers and File Management in C</b> Definition of pointer, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures. Opening, closing and I/O operations on files, random access to files, command line arguments.	2
Books:	1.	Yashavant Kanetkar, <b>Let Us C</b> , Eighth Edition, BPB Publications.	
	2.	Kernighan and Ritchie, <b>The C Programming Language</b> , Second Edition, Prentice Hall, 1998.	

**Course Code : DSC-103**

**Course Name : MATHEMATICS-I**

**Course Outcome:**

After completing this course the student will be able to

- Understand matrix and types of matrix, rank, nullity, Eigen values and vector,
- Solving linear system of equations using Cramer's rule.
- Understand the relationship with matrix and vectors.
- Perform operations on matrices such as addition, subtraction and multiplication and perform transformation of matrices
- Understand determinant of a square matrix, minor, cofactor, adjoint of a matrix and inverse matrix, determinant of a square matrix, minor, cofactor, singularity concepts, Cayley-Hamiltonian matrix, symmetry and skew-symmetry matrix, transpose of a matrix, complex conjugate.
- Define complex number and to represent them, argand plane, argand diagram, polar form, complex quadratic.
- Relationship between roots and coefficients of complex quadratic equation, representation of complex number in 2D, understand the nature of the roots using discriminant concepts.
- Understand basics of limits, L'Hospital rule, derivatives and calculus, Algebra of limits, graphical representation of limit, neighborhood concepts, convergence applied in limit.
- Limit indeterminate form  $(0/0), (\infty/\infty)$ , concepts of trigonometric functions.
- Algebra of differentiation, double -differentiation, understand the concepts of first principal of differentiation.
- Understand the concepts of Rolle's theorem its graphical representation with applications , concepts of MVT(Mean-Value-Theorem).
- Concepts of Lagrange's MVT (LMVT) and its application using graphical representation, Maxima-minima of functions with the help of sign convention.



**Detailed Syllabus:**

<b>UNIT</b>	<b>Content</b>	<b>Weeks</b>
1	<p><b>Determinants and Matrices</b>            Definition and different types (such as identity matrix, diagonal matrix etc) of matrices, vectors and matrices. Addition, subtraction and multiplication of matrices. Properties of matrix operations. Existence of additive and multiplicative identity and additive inverse matrices. Transpose of a matrix and its properties. Symmetric and skew symmetric matrices. Elementary transformation of a matrix. Invertible matrices.            Determinant of a square matrix, minor, cofactor. Adjoint of a matrix and matrix inversion. Determination of rank of a matrix. Determinant of a square matrix, minor, cofactor. Adjoint of a matrix and matrix inversion and            Eigen vectors of a matrix (Stressing on symmetric matrices). Cayley- Hamilton theorem - Cramer's rule.</p>	4
2	<p><b>Complex Numbers</b>            Definition and Algebra of complex numbers. Modulus and conjugate of a complex number. Representation of complex numbers - Argand diagram and polar representation.            Roots of linear and quadratic equations in one variable, real roots, irrational roots, complex roots, Relation between the roots and the coefficients. and Balance Sheet for Proprietary concerns,</p>	3
3	<p><b>Limits and Derivatives</b>            Intuitive idea of limits and derivatives. Limits of polynomials, rational functions and Indeterminate forms. Derivatives, Algebra of derivative of a function. Derivative of polynomials and trigonometric functions.</p>	4
4	<p><b>Calculus</b>            Roll's theorem, Lagrange's Mean Value theorem. Meaning of the sign of derivative., maxima and minima (single variable).</p>	4
Books	<p>1. Narayanan S. and Manickavachagam , <b>Allied Mathamatics Vol .1&amp; Vol .2.</b>            2. M.K. Venkataraman, NPC, <b>Engineering Mathematics Vol.1 &amp; Vol .2,</b></p>	

**Course Code : VAC-101**

**Course Title: Indian Knowledge System**

**Course Outcome:**

- The students will understand the concepts of Indian traditional knowledge and its importance
- The students will understand with the various aspects of Indian traditional knowledge and their relevance today

### Detailed Syllabus

UNIT	Content	Weeks
1	Defining Indian Knowledge System. Importance of Ancient Knowledge, The IKS Corpus. Introduction to Traditional Knowledge: Concept & Definition, Nature, Scope and Importance of Traditional Knowledge. The Vedic Corpus: Introduction to Vedas, The Four Vedas. Philosophical System: Development and Unique Features. Bhagavad Gita	3
2	The Vedangas and Other Streams of Indian Knowledge System: The six Vedangas — Siksha, Vyakarana, Chandas, Nirukta, Jyotisha and Kalpa.	3
3	Indian Mathematics: Numbers, fractions and geometry in the Vedas. Decimal nomenclature of numbers in the Vedas. Zero and Infinity. The development of the decimal place value system which resulted in a simplification of all arithmetical operations. Linguistic representation of numbers. Important texts of Indian mathematics. Brief introduction to the development of algebra, trigonometry and calculus.	3
4	Indian Astronomy: Ancient records of the observation of the motion of celestial bodies in the Vedic corpus. Sun, Moon, Nakshatra & Graha. Astronomy as the science of determination of time, place and direction by observing the motion of the celestial bodies. The motion of the Sun and Moon. Motion of equinoxes and solstices. Elements of Indian calendar systems. Basic ideas of the planetary model of Aryabhata and its revision by Nilakantha	3
5	7. Indian Health Sciences: Vedic foundations of Ayurveda. Basic concepts of Ayurveda. The three Gunas and three Doshas, Pancha-mahabhuta and Sapta-dhatu. Six Rasas and their relation to Doshas. Ayurvedic view of the cause of diseases. Dinacharya or daily regimen for the maintenance of good health. Current revival of Ayurveda and Yoga.	3
Books:	1. Baladev Upadhyaya, Samskrta Śāstrom ka Itihās, Chowkhambha, Varanasi, 2010	
	2. D. M. Bose, S. N. Sen and B. V. SuBCArayappa, Eds., A Concise History of Science in India, 2nd Ed., Universities Press, Hyderabad, 2010.	
	3. Astāngahrdaya, Vol. I, Sūtrasthāna and Śārīrasthāna, Translated by K. R. Srikantha Murthy, Vol. I, Krishnadas Academy, Varanasi, 1991.	
	4. Dharampal, Some Aspects of Earlier Indian Society and Polity and Their Relevance Today, New Quest Publications, Pune, 1987	

	5. Dharampal, Indian Science and Technology in the Eighteenth Century: Some Contemporary European Accounts, Dharampal Classics Series, Rashtrottana Sahitya, Bengaluru, 2021	
	6. Dharampal, The Beautiful Tree: Indian Indigenous Education in the Eighteenth Century, Dharampal Classics Series, Rashtrottana Sahitya, Bengaluru, 2021.	
	7. J. K. Bajaj and M. D. Srinivas, Indian Economy and Polity in Eighteenth century Chengalpattu, in J. K. Bajaj ed., Indian Economy and Polity, Centre for Policy Studies, Chennai, 1995, pp. 63-84.	
	8. M. D. Srinivas, The methodology of Indian sciences as expounded in the disciplines of Nyāya, Vyākaraṇa, Ganita and Jyotisa, in K. Gopinath and Shailaja D. Sharma (eds.), The Computation Meme: Explorations in Indic Computational Thinking, Indian Institute of Science, Bengaluru, 2022 (in press).	

\*\*\*\*\*

## SEMESTER – II

**Course Code : DSC-201**

**Course Title : Data Structure and Algorithm**

### Course Outcome:

After completing this course the student will be able to

- Use and implement various searching and sorting techniques and algorithms
- Understand the time and computation complexity of algorithms and understand concept of Big - O notation.
- Implement Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, and Heap Sort and compare their performance.
- Implement stacks, queues and linked list
- Implement graph search and traversal algorithms.
- to perform various operations and implement 1-D and 2-D arrays

### Detailed Syllabus:

UNIT	Content	Weeks
1	<b>Introduction to Data Structure</b> : Linear and Non Linear Data structure	1
2	<b>Linear Data Structure:</b> Array(one and two dimension),Application of Array, Linkedlist(singly, double and circular) and its application,Stack ,Queue and its application.	4
3	<b>Non linear Data structure:</b> Binary tree, Binary search Tree, properties of binary tree and its types, Tree traversal methods	3
4	<b>Graph algorithms</b> : Graph ,DFS and BFS, Graph representation in memory, Spanningtree, Kruskal and Prim's Algorithm	4
5	<b>Algorithm Concepts and sorting and searching techniques</b> Analysis of Algorithm: Time and Space complexity of algorithms,average case,best case and worst case analysis Sorting and Searching algorithm such as Selection sort, Insertion-sort, Bubble-sort, Binary search, Linear search.	3
<b>Books</b>	1. Classic Data Structure : By D Samanta	
	2. Data Structure Through C++ By Y Kanetkar	
	3. Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education	

**Course Code: DSC-202**  
**Course Name: Mathematics - II**

**Course Outcome:**

After completing this course the student will be able to-

- Understand sets, relations and functions. Types of functions and basic operations in set theory.
- Concepts of Venn diagram, De Morgan’s law, some properties in set operations
- Understand the concepts of properties in Relation, equivalence relation and classes, equivalence class partitions.
- Understand the method to proof and mathematical statement using mathematical induction concepts.
- Understanding the basics of combinatorics, and be able to apply the methods from these subjects in problem solving.
- be able to use effectively algebraic techniques to analyze basic discrete structures and algorithms.
- Understand the basic concepts of sequence and series, convergence and divergence concepts.
- understand basic properties of arithmetic progression and geometric progression, mean concepts in AP & GP, helps to calculate the sum of special series without actually calculate.
- Understand the concepts of bounded function, supremum(l.u.b) and infimum(g.l.b), using these concepts we can find the limit point, convergent or divergent of a function.
- Understand basic properties of graphs and related discrete structures, types of graphs , using graph concepts it is useful to find the shortest distance between any two points.
- Understand the concepts of walk, path and cycle. Difference between normal graph and weighted graph, how a particular real world scenario can put in graph and check the possibilities.
- Understand the concepts of Hamiltonian circuit. Directed and Undirected concepts in a graph.
- Concepts of geodesic and its use case in google map.

**Detailed Syllabus:**

<b>Unit</b>	<b>Content</b>	<b>Weeks</b>
<b>1</b>	<p><b>Sets, relations and functions</b></p> <p>Definition and representation of sets, cardinality of sets, elementary set operations- union, intersection, difference, Cartesian product, concept of universal set and complementation, Venn diagram, De Morgan’s Law, simple properties of set operations.</p> <p>Relations, properties of binary relation-reflexive, symmetric, and transitive, equivalence relations, equivalence classes and partitions.</p> <p>Functions, one-to-one and onto function, composition of functions, invertible functions, Principle of mathematical induction.</p>	<b>4</b>
<b>2</b>	<p><b>Combinatorics and recurrence relations</b></p> <p>Permutations, Combinations, permutations with repetitions, combinations with repetitions, recurrence relations and theirsolutions.</p>	<b>3</b>

<b>3</b>	<p><b>Sequence and Series</b></p> <p>Sequence, Arithmetic Progression and Geometric Progression, general term, A.M. (Arithmetic Mean), G.M.(Geometric Mean). Relation between A.M and G.M. Sum of AP and GP series, Sum to nterms of special series.</p> <p>Sequence of real numbers, bounded, convergent and divergent sequence, uniqueness of the limit and bounds of convergent sequence. Infinite series, exponential and logarithmic series.</p>	<b>4</b>
<b>4</b>	<p><b>Basic of Graph Theory:</b> Various types of graphs, paths and cycles, directed and undirected graphs, Hand Shaking Theorem, Eulerian and Hamiltonian graphs, Graph connectivity, graph traversals, Isomorphism of graphs, Subgraphs, Complement of graph,, matrix representation of graphs.Trees: Properties of trees, rooted trees. Distance and centres in trees.</p>	<b>4</b>
<b>Books</b>	1. Tremblay, J.P, Manohar, R. Discrete Mathematical Structures with Application to Computer Science.	
	2. Discrete Mathematics, N. Ch. SN Iyenger, K.A. Venkatesh, V.M. Chandrasekaran, P.S. Arunachalam, Vikash Publishing House Pvt. Ltd.	
	3. Graph Theory By Narsingha Deo	

**Course Code: DSC-203**  
**Course Title: Digital Logic**

**Learning Outcome**

On the successful completion of the course, students will be able to

- Understand the fundamental concepts and techniques used in digital electronics.
- Understand various number systems and its application in digital design.
- Understand various combinational and sequential circuits.
- Design various combinational and sequential circuits.

**Detailed Syllabus**

Unit	Content	Weeks
1	<p><b>Representation of information:</b> Number system, Idea about number representation, Decimal, binary, octal, hexadecimal number system and their arithmetic. Representation of negative numbers.</p>	1

2	<b>Boolean Algebra and logic gates:</b> Axiomatic definition of Boolean algebra, Rules (postulates and basic theorems) of Boolean algebra, dual and complement of Boolean expression, Canonical form and Standard form, Sum of product and product of sum form, Conversion between Boolean expression and truth table, Karnaugh map method (upto four variable k-map), Don't care condition, Different types of gates, Implementation of logic expression with logic gates.	5
2	<b>Combinational Circuit:</b> Adder: half adder, full adder, Subtractor: half subtractor and full subtractor, Magnitude comparator, Decoder, Encoder, Application examples of decoder and encoder, Multiplexer, Demultiplexer, Application examples of multiplexer and Demultiplexer.	4
3	<b>Sequential Circuit:</b> Simple RS flip-flop or latch, Clocked RS flip-flop, D flip-flop, JK flip-flop, T flip-flop, Analysis of Clocked Sequential circuits, State Reduction and Assignment, Flip –Flop Excitation tables, Design Procedure for sequential circuits.	4
4	<b>Registers and counters:</b> Introduction to registers and counters. Types of registers and counters, Use of registers and counters.	1
<b>Books</b>	1.M. M. Mano, Digital Logic and Computer Design, PHI, 1994 C.	
	2. Bartee, Computer Architecture and Logic Design, McGraw Hill, 1991	

**Course Code: VAC-201**

**Course Name: Constitution of India**

**Course Outcome:**

- Understand the key aspects of the Indian Constitution.
- Comprehend the structure and philosophy of the Constitution
- Understand the power and functions of various constitutional offices and institutions.
- Realize the significance of the constitution and appreciate the role of constitution and citizen oriented measures in a democracy.

UNIT	Content	Weeks
1	Indian Constitution: Meaning and Significance of Constitution, Constituent Assembly, Preamble and Salient features of the Indian Constitution, Fundamental Rights, Fundamental Duties. Directive Principles	3
2	Union and State Government: President of India, Prime Minister and Cabinet, Governor, Chief Minister and Council of Ministers	3

3	Legislature and Judiciary: Parliament( Lok Sabha and Rajya Sabha), State Legislative Assembly and Legislative Council , Judicial System in India, Supreme Court and High Court	3
4	Governance and Constitution: Federalism in India, Local Government, Election Commission	3
5	Role and Responsibilities of Citizens under Indian Constitution: Concept of Citizenship, Citizenship Amendment Act, Fundamental Duties, Right to Information Act. Goals and Policies of National Development enshrined in the Constitution: Concept of National Development, Unity and Integrity of the nation, Goals of Educational Policies	3
Books:	1. K. Sharma, Introduction to the Constitution of India, Prentice Hall of India, New Delhi, 2002 2. Introduction to the Constitution of India - 26/edition D D Basu Educational Printed; 26th edition (28 September 2022) 3. <a href="https://legislative.gov.in/constitution-of-india/">https://legislative.gov.in/constitution-of-india/</a>	

**Course Code: SEC-201**

**Course Name: Professional Communication**

After completing this course students will be able to:

- Develop effective listening, reading and writing skills for professional communications.
- Develop skills like personal interviews and group discussions.
- Develop presentation skills

UNIT	Content	Weeks
1	Reading & Listening Comprehension: Ways to improve the Speed & Efficiency of Reading ,Importance of Skim Reading, Note Making, Linear Note- Making & Patterned Note- Taking, Listening Skills & Features of Effective Listening, Benefits of Effective Listening	4
2	Writing Skills: C V & Resume writing, Job Application letter/Covering letter, Precis making.: Principles of condensation, Rules for writing précis Paragraph writing , Development of paragraph	4



3	Group Discussion and Interview Skills: Group Discussion: Meaning & Significance, How to prepare & practice for GD, Common Pitfalls in a GD, Definition & Conventions of a Seminar, Definition, Skills & Techniques, Preparation, Negative Interview Factors & Interview Tips	4
4	Presentation Skills: Presentation strategies: Purpose, Audience and locale, Organizing contents, Audio-Visual aids, Nuances of Delivery, Body language, Voice dynamics.	3
Books:	1. Raman, Meenakshi & Sharma, Sangeeta. Technical Communication: Principles and Practice, Oxford University Press	
	2. Konar, Nira. Communication Skills For Professionals, PHI Learning Pvt. Ltd	
	3. Board of Editors. Written and Spoken Communication in English, University 4. Press	

\*\*\*\*\*

\*