

INDIRA GANDHI UNIVERSITY

Meerpur-Rewari, Haryana (122502)

(A State University Established under Haryana Act No.29 of 2013)

(Recognized u/s 12(B) & 2(f) of UGC Act, 1956)



SCHEME OF EXAMINATION & SYLLABI

in accordance with National Education Policy-2020

for

Undergraduate Programmes

Multi-Disciplinary Courses (MDC)

Skill Enhancement Courses (SEC)

Vocational Courses (VOC)

Offered by Department of Computer Science & Engineering

(Effective from Academic Session:2026-27)

DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF ENGINEERING & TECHNOLOGY

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Scheme of MDC, VAC, SEC, AEC and VOC courses
offered in the University Pool
by the
Department of Computer Science

Scheme of MDC, VAC, SEC and VOC courses

Sem ester	Course Type	Applicable Scheme	Course Code	Nomenclature of the Course	Credits			Contact hours L: Lecture T: Tutorial P: Practical				Internal Assessment Marks		End term Examination Marks		Total Marks	Exam. Hours	
					Total	Theory (T)	Practical (P)	L	T	P	Total	T	P	T	P		T	P
1	MDC-1	Scheme A, B, C & D	26L4.5- MDC- CSE-101	Fundamentals of Computer Science	3	3	0	3	0	0	3	25	0	50	0	75	3	0
2	MDC-2	Scheme A, B, C & D	26L4.5- MDC- CSE-201	Web Technologies Fundamentals	3	3	0	3	0	0	3	25	0	50	0	75	3	0
3	MDC-3	Scheme A, B, C & D	26L5.0- MDC- CSE-301	Programming with C	3	3	0	3	0	0	3	25	0	50	0	75	3	0
1	SEC-1	Scheme A, B, C & D	26L4.5- SEC- CSE-101	Office and Spreadsheet Tools Learning	3	2	1	2	0	2	4	15	5	35	20	75	2	2
1	SEC-2	Scheme A, B, C & D	26L4.5- SEC- CSE-102	Advance Spreadsheet Tools	3	2	1	2	0	2	4	15	5	35	20	75	2	2
1	SEC-3	Scheme A, B, C & D	26L4.5- SEC- CSE-103	Basic IT Tools	3	2	1	2	0	2	4	15	5	35	20	75	2	2

1	SEC-4	Scheme A, B, C & D	26L4.5- SEC- CSE-104	Essentials of Python	3	2	1	2	0	2	4	15	5	35	20	75	2	2
1	SEC-5	Scheme A, B, C & D	26L4.5- SEC- CSE-105	Introductory Course in R	3	2	1	2	0	2	4	15	5	35	20	75	2	2
1	SEC-6	Scheme A, B, C & D	26L4.5- SEC- CSE-106	Computer Programmin g in C	3	2	1	2	0	2	4	15	5	35	20	75	2	2
2	SEC-7	Scheme A, B, C & D	26L4.5- SEC- CSE-201	Cloud Computing Skills	3	2	1	2	0	2	4	15	5	35	20	75	2	2
3	SEC-8	Scheme A, B, C & D	26L5.0- SEC- CSE-301	Advance IT Skills	3	2	1	2	0	2	4	15	5	35	20	75	2	2
3	VOC-1	Scheme B only	26L5.0- VOC- CSE-301	Animation	4	3	1	3	0	2	5	25	5	50	20	100	3	2
3	VOC-2	Scheme B only	26L5.0- VOC- CSE-302	Web Designing	4	3	1	3	0	2	5	25	5	50	20	100	3	2
4	VOC-3	Scheme A, B, C & D	26L5.0- VOC- CSE-401	Graphics Designing	4	3	1	3	0	2	5	25	5	50	20	100	3	2

4	VOC-4	Scheme A, B, C & D	26L5.0- VOC- CSE-402	3-D Graphics	4	3	1	3	0	2	5	25	5	50	20	100	3	2
4	VOC-5	Scheme A, B, C & D	26L5.0- VOC- CSE-403	Software Testing	4	3	1	3	0	2	5	25	5	50	20	100	3	2
5	VOC-6	Scheme A, C & D	26L5.5- VOC- CSE-501	Animation	4	3	1	3	0	2	5	25	5	50	20	100	3	2
5	VOC-7	Scheme A, C & D	26L5.5- VOC- CSE-502	Web Designing	4	3	1	3	0	2	5	25	5	50	20	100	3	2
6	VOC-8	Scheme A, B, C & D	26L5.5- VOC- CSE-601	Mobile Application Designing	4	3	1	3	0	2	5	25	5	50	20	100	3	2
6	VOC-9	Scheme A, B, C & D	26L5.5- VOC- CSE-602	Analytics with Python	4	3	1	3	0	2	5	25	5	50	20	100	3	2
6	VOC-10	Scheme A, B, C & D	26L5.5- VOC- CSE-603	Data Analytics with R	4	3	1	3	0	2	5	25	5	50	20	100	3	2

Multi-Disciplinary Courses (MDC)

(Computer Science)

Part A - Introduction			
Name of the Programme	Computer Applications		
Semester	I		
Nature of Course/Course Composition	Theory		
Name of the Course	Fundamentals of Computer Science		
Course Code	26 L4.5-MDC-CSE-101		
Course Type	MDC-1		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ -understand the basics of computer CLO ₂ -learn about I/O devices and operating systems CLO ₃ -understand internet and its services.		
	Theory	Practical	Total
Credits	3	0	3
Teaching Hours per week	3	0	3
Internal Assessment Marks	25	0	25
End Term Exam Marks	50	0	50
Max. Marks	75	0	75
Examination Duration (in Hours)	03	0	
Part B - Contents of the Course			
Instructions for Paper- Setter: The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
Unit	Topics		Contact Hours/ CLOs
I	Computer Fundamentals: Evolution of Computers through generations, Characteristics of Computers, Strengths and Limitations of Computers, Classification of Computers, Functional Components of a Computer System, Applications of computers in Various Fields. Types of Software: System software, Application software, Utility Software.		15/CLO ₁
II	Memory Systems: Concept of bit, byte, word, nibble, storage locations and addresses, measuring units of storage capacity, access time, concept of memory hierarchy. Primary Memory - RAM, ROM, PROM, EPROM. Secondary Memory - Types of storage devices, Magnetic Tape, Hard Disk, Optical Disk, Flash Memory. I/O Devices: I/O Ports of a Desk Top Computer, Device Controller, Device Driver. Input Devices: classification and use, keyboard, pointing devices - mouse, touch pad and track ball, joystick, magnetic stripes, scanner, digital camera, and microphone Output Devices: speaker, monitor, printers: classification, laser, ink jet, dot-matrix. Plotter.		15/CLO ₂
III	Introduction to Operating System: Definition, Functions, Features of Operating System, Icon, Folder, File, Start Button, Task Bar, Status Buttons, Folders, Shortcuts, Recycle Bin, Desktop, My Computer, My Documents, Windows Explorer, Control Panel. The Internet: Introduction to networks and internet, history, Internet, Working of the Internet, Modes of Connecting to Internet. Electronic Mail: Introduction, advantages and disadvantages, User Ids, Passwords, e-mail addresses, message components, message composition, mailer features. Browsers and search engines		15/CLO ₃
	Total Contact hours		45
Evaluation Methods			

Internal Assessment:25 Marks		End Term Examination: 50 Marks
• Class Participation:	5	Written Examination:50
• Seminar/presentation/assignment/quiz/ class test etc.:	5	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB. • Dromey, R.G., How to Solve it By Computer, PHI. • Norton, Peter, Introduction to Computer, McGraw-Hill. • Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World. • Rajaraman, V., Fundamentals of Computers, PHI.		

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	2	3	3	2	3	2	3	2
CLO ₂	3	1	3	3	2	3	3	3	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	2	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	45
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Any Other	45

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	II		
Nature of Course/Course Composition	Theory		
Name of the Course	Web Technologies Fundamentals		
Course Code	26 L4.5-MDC-CSE-201		
Course Type	MDC-2		
Course Level	100-199		
Pre-requisite for the course (if any)	Basic Knowledge of Computer		
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : To know Protocols of Internet, World Wide Web CLO ₂ : To describe the planning the site and navigation. CLO ₃ : To apply the concept Text Basics, Document: Images and Multimedia. To impart the Need for CSS, introduction to CSS.		
	Theory	Practical	Total
Credits	3	0	3
Teaching Hours per week	3	0	3
Internal Assessment Marks	25	0	25
End Term Exam Marks	50	0	50
Max. Marks	75	0	75
Examination Duration (in Hours)	03	0	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter:</u> The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
Units	Topics		Contact Hours/ CLOs
I	Introduction: Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser, HTML, HTTP, SMTP, POP3, MIME, IMAP. Web site design principles, planning the site and navigation. HTML and CSS: History of HTML, Structure of HTML Document: Text Basics, Document: Images and Multimedia, Links and webs, Document Layout, Cascading Style Sheet: 4 Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS		15/CLO ₁
II	XML: Introduction of XML- Some current applications of XML, Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, Document Type Definition (DTD), types. XML Objects, Checking Validity, Understanding XLinks, XPointer, Event driven Programming, XML Scripting		15/CLO ₂
III	PHP: PHP Introduction, Structure of PHP, PHP Functions, AJAX with PHP, PHP Code and the Complete AJAX Example. AJAX Database, Working of AJAX with PHP, Ajax PHP Database Form, AJAX PHP MySQL Select Query.		15/CLO ₃
	Total Contact hours		45
Evaluation Methods			
Internal Assessment:25 Marks		End Term Examination: 50 Marks	

• Class Participation:	5	Written Examination:50
• Seminar/presentation/assignment/quiz/ class test etc.:	5	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
• Steven Holzner,”HTML Black Book”, Dremtech press. • Developing Web Applications, 2ed by Savaliya, Wiley India Ltd • Web Technologies, Black Book, Dreamtech Press • Web Applications: Concepts and Real World Design, Knuckles, Wiley-India • Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book by Kogent, Wiley India Ltd. • Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.		

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	2	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	2	3	3	3	3	3	2	3	1
CLO ₃	3	2	3	3	3	2	3	3	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	45
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Any Other	45

Part A–Introduction			
Name of the Programme	Computer Applications		
Semester	III		
Nature of Course/Course Composition	Theory		
Name of the Course	Programming with C		
Course Code	26 L5.0-MDC-CSE-301		
Course Type	MDC-3		
Course Level	200-299		
Pre-requisite for the course (if any)	Basic Knowledge of computer		
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Learn the basics of C program, data types and input/output statements. CLO ₂ : Understand different types of operators, their hierarchies and also control statements of C. CLO ₃ : Implement programs using arrays and strings.		
	Theory	Practical	Total
Credits	3	0	3
Teaching Hours per week	3	0	3
Internal Assessment Marks	25	0	25
End Term Exam Marks	50	0	50
Max. Marks	75	0	75
Examination Duration (in Hours)	03	0	
Part B-Contents of the Course			
Instructions for Paper- Setter:			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
Unit	Topics		Contact Hours/ CLOs
I	Overview of C: History, Importance, Structure of C Program, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant. Input/output: Formatted I/O Function-, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(), output functions viz. printf(), putchar(), puts(). Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators Operator Hierarchy; Arithmetic Expressions, Evaluation of Arithmetic Expression, Type Casting and Conversion. Decision making with if statement, if-else statement, nested if statement, switch and break statement, goto statement, Looping Statements: for, while, and do-while loop, jumps in loops.		15/CLO ₁
II	Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation. Functions: definition, prototype, function call, passing arguments to a function: call by value; call by reference, recursive functions. Strings: Declaration and Initialization, String I/O, Array of Strings, String Manipulation Functions: String Length, Copy, Compare, Concatenate etc., Search for a Substring.		15/CLO ₂
III	Pointers in C: Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays. User defined data types: Structures - Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, Array of Structures; Unions – Union definition; difference between Structure and		15/CLO ₃

	Union.	
	Total Contact hours	45
Evaluation Methods		
Internal Assessment:25 Marks		End Term Examination: 50 Marks
• Class Participation:	5	Written Examination:50
• Seminar/presentation/assignment/quiz/ class test etc.:	5	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
• Gottfried, Byron S., Programming with C, Tata McGraw Hill. • Balagurusamy, E., Programming in ANSI C, Tata McGraw-Hill. • Jeri R. Hanly; Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley. • Yashwant Kanetker, Let us C, BPB. • Rajaraman, V., Computer Programming in C, PHI. • Yashwant Kanetker, Working with C, BPB.		

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	2	3	3	3	3	2	3	3
CLO ₂	3	3	3	3	3	1	3	3	2	3	3
CLO ₃	3	2	3	3	3	3	3	3	3	2	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	45
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Any Other	45

Skill Enhancement Courses (SEC)

(Computer Science)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
INDIRA GANDHI UNIVERSITY, MEERPUR, REWARI

Part A–Introduction			
Name of the Programme	Computer Science		
Semester	I		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Office and spreadsheet Tools Learning		
Course Code	26L4.5-SEC-CSE-101		
Course Type	SEC		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - understand the basic concepts of operating systems. CLO ₂ - do the basic editing and formatting in a document. CLO ₃ - to understand the working of operating system and various office tools practically.		
	Theory	Practical	Total
Credits	2	1	3
Teaching hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Duration (in Hours)	2	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units. <u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
I	Operating System - Definition, Functions, Types of Operating System, Basics of Popular Operating Systems, The User Interface, Using Menu and Menu-selection, managing files and folders, Control panel – display properties, add/remove software and hardware, Common utilities. Word Processing - Introduction to Word Processing, Menus, Creating, Editing & Formatting Document, Spell Checking, Printing, Views, Tables, Word Art, Mail Merge, Macros, inserting hyperlinks, Modifying page setup, Applying document themes, Applying document style sets, Inserting headers and footers.		15/CLO ₁

II	Spread Sheet: Elements of Electronics Spread Sheet, Applications, Creating and Opening of Spread Sheet, Menus, Manipulation of cells: Enter texts numbers and dates, Cell Height and Widths, copying of cells, Mathematical, Statistical and Financial function, Drawing different types of charts, Sort and Filter Data. Presentation Software: Creating, Modifying and enhancing a presentation, Type of presentation views, using sound, Animation, Working with Objects, Printing.	15/CLO ₂			
Practical	Practicum: - Operating System: Starting with basics of Operating Systems and its functionalities Word Processing: - Create and format word documents. - Use tables, word Art and other features in your documents. - Use macros to simplify the tasks in a document. - Use mail merge to write once for many. Spread Sheet: - Use spreadsheet for basic data handling - Apply formulas to sheet for automation. - Use Charts & Shapes for better visualization of the data. - Use sorting and filtering of the data Presentation Software: - Prepare and format presentations. - Apply slide transitions, animations and sequencing for slides. - Apply different formatting and insert options to make presentation better. - Appling sound and animation.	30/CLO ₃			
	Contact Hours	60			
Evaluation Methods					
Internal Assessment:20	TH-15	PR-5	End Term Examination:55	TH-35	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	35	NA
Mid-Term Exam:	5	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Recommended Books/e-resources/LMS: - Help files from Apache Open Office, https://wiki.openoffice.org/wiki/Documentation - Channelle Andy, “Beginning OpenOffice 3: From Novice to Professional”, PressPublications - Beginning OpenOffice 3: From Novice to Professional, Andichannele, Apress. - Microsoft Office 2016 Step by Step: MS Office 2016 Step by Step, By Joan Lambert, Curtis Frye - Computer Fundamentals - By Pradeep K. Sinha, Priti Sinha, BPB Publications, 6th Edition - Getting Started with LibreOffice 5.0, Friends of Open Documents Inc., http://friendsofopendocument.com - Documentation from LibreOffice, https://documentation.libreoffice.org/en/english-documentation/					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Part A–Introduction			
Name of the Programme	Computer Science		
Semester	I		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Advance Spreadsheet Tools		
Course Code	26L4.5-SEC-CSE-102		
Course Type	SEC		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - create and format spreadsheets. CLO ₂ - create charts and protect worksheets. CLO ₃ - to implement various spreadsheet tools practically.		
	Theory	Practical	Total
Credits	2	1	3
Teaching hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Duration (in Hours)	2	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units. <u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
I	Manage Workbook Options and Settings: Create Worksheets and Workbooks, navigate in Worksheets and Workbooks, Format Worksheets and Workbooks, Customize Options and Views for Worksheets and Workbooks, Configure Worksheets and Workbooks for Distribution Apply Custom Data Formats and Layouts: Apply Custom Data Formats and Validation, Apply Advanced Conditional Formatting and Filtering, Create and Modify Custom Workbook Elements Create Tables: Create and Manage Tables, Manage Table Styles and Options, Filter and Sort a Table Perform Operations with Formulas and Functions: Summarize Data by using Functions, Perform Conditional Operations by using Functions, Format and Modify Text by using Functions.		15/CLO ₁

II	Create Charts and Objects: Create Charts, Format Charts, Insert and Format Objects Manage Workbook Options and Settings: Manage Workbooks, Manage Workbook Review Restrict editing. Create Advanced Formulas: Apply Functions in Formulas, look up data by using Functions, Apply Advanced Date and Time Functions, Perform Data Analysis and Business Intelligence, Define Named Ranges and Objects, Create Advanced Charts and Tables: Create and Manage PivotTables, Create and Manage Pivot Charts	15/CLO ₂			
Practical	Practicum: Spread Sheet: • Use spreadsheet for basic data handling • Apply formulas to sheet for automation. • Use if-else to make certain decisions in a sheet. • Use Charts & Shapes for better visualization of data. • Use filters and data validation controls for control of data • Formatting data and spreadsheets • Creating and managing tables • Use Pivot table and charts • Use what-if analysis along with goal seek and scenarios	30/CLO ₃			
	Contact Hours	60			
Evaluation Methods					
Internal Assessment:20	TH-15	PR-5	End Term Examination:55	TH-35	PR-20
• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	35	NA
• Mid-Term Exam:	5	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Recommended Books/e-resources/LMS: • Help files from Apache Open Office, https://wiki.openoffice.org/wiki/Documentation • Chanelle Andy, “Beginning OpenOffice 3: From Novice to Professional”, a PressPublications • Beginning OpenOffice 3: From Novice to Professional, And Chanelle, A press. • Microsoft Office 2016 Step by Step: MS Office 2016 Step by Step, By Joan Lambert,Curtis Frye • Getting Started with LibreOffice 5.0, Friends of Open Documents Inc.,Http://friendsofopendocument.com • Documentation from LibreOffice, https://documentation.libreoffice.org/en/english-documentation/ • Walter Holland, Microsoft Office 2013 Digital Classroom • Wayne L. Winston, Data Analysis and Business Modeling					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	2	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Part A–Introduction			
Name of the Programme	Computer Science		
Semester	I		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Basic IT Tools		
Course Code	26L4.5-SEC-CSE-103		
Course Type	SEC		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - Acquaint with Operating System and its applications for both desktop and mobile devices. CLO ₂ - Understand computer networks, and browse the inter-net, content search, email and collaborate with peers CLO ₃ - To implement various spreadsheet tools practically.		
	Theory	Practical	Total
Credits	2	1	3
Teaching hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Duration (in Hours)	2	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units. <u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
I	Introduction to Computer: Computer and Latest IT gadgets, Evolution of Computers & its applications, Basics of Hardware and Software, Application Software, Systems Software, Utility Software. Central Processing Unit, Input devices, Output devices, Computer Memory & storage, Mobile Apps. Introduction to Operating System, Functions of the Operating system, Operating Systems for Desktop and Laptop, Operating Systems for Mobile Phone and Tablets, User Interface for Desktop and Laptop, Task Bar, Icons & shortcuts, Running an Application, Operating System Simple Setting, Changing System Date and Time, Changing Display Properties, To Add or Remove Program and Features, Adding, Removing & Sharing Printers, File and Folder Management.		15/CLO ₁

II	Introduction to Internet and World Wide Web, Basic of Computer Networks, Local Area Network (LAN), Wide Area Network (WAN), Network Topology, Internet, Applications of Internet, Website Address and URL, Popular Web Browsers (Internet Explorer/Edge, Chrome, Mozilla Firefox, Opera etc.), Popular Search Engines, Searching on the Internet. E-mail: Using E-mails, Opening Email account, Mailbox: Inbox and Outbox, Creating and Sending a new E-mail, replying to an E-mail message, forwarding an E-mail message, searching emails, Attaching files with email, Email Signature. Social Networking: Facebook, Twitter, LinkedIn, Instagram, Instant Messaging (WhatsApp, Facebook Messenger, Telegram), Introduction to Blogs, Digital Locker.	15/CLO ₂			
Practical	Practicum: Spread Sheet: - Identify the various parts of computer - Using computer/mobile software and hardware - Use of operating system for various tasks such as file creation, directory creation, shortcut creation, using control panel, etc. - Using Internet & various browsers. - Identify the various hardware/software required for Internet - How to create and use e-mail account - Using Facebook, WhatsApp, Instagram, LinkedIn, Telegram - Writing blogs	30/CLO ₃			
	Contact Hours	60			
Evaluation Methods					
Internal Assessment:20	TH-15	PR-5	End Term Examination:55	TH-35	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	35	NA
Mid-Term Exam:	5	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Recommended Books/e-resources/LMS: - Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB - Drome, R.G., How to Solve it By Computer, PHI - Norton, Peter, Introduction to Computer, McGraw-Hill - Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World - Rajaraman, V., Fundamentals of Computers, PHI - Ram, B., Computer Fundamentals, Architecture & Organization, New Age International(P) Ltd.					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	2	3	3	3	3	2	3	2
CLO ₂	2	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Part A–Introduction			
Name of the Programme	Computer Science		
Semester	I		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Essentials of Python		
Course Code	26L4.5-SEC-CSE-104		
Course Type	SEC		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - Understand the basic concepts of Python, Learn the syntax and semantics of Python Programming Language. CLO ₂ -Write Python functions to facilitate code reuse and manipulate strings. CLO ₃ - Understand the basic concepts of Python Programming practically.		
	Theory	Practical	Total
Credits	2	1	3
Teaching hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Duration (in Hours)	2	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units. <u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
I	Keywords and Identifiers; Comments: Purpose/use of comments, Single line comment/Multiline comment; Python Variables: Declaration of Variables, Assign Values to Variables, Initialization, Reading, Variable naming restrictions, and Types of Python Variables. Python Data Types: Implicit Declaration of Data Types, Python Numbers (Integers, floating-point numbers, and complex numbers), Python Strings, Python Boolean data type. Operators: Arithmetic, Comparison/Relational Operators, Increment Operators, Logical operators, Identity Operators, and Operators Precedence. Python Control Flow Statement, Decision Making: Simple If Structure, if-else structure, if else if structure, and nested If Structure;		15/CLO ₁

II	Looping: Python Loop Statements. Python while loop, Python for loop, Python range (), Python Nested Loop Structures, and Inserting conditions in Loops and vice versa; Python Branching Statements – break, continue, pass. Python Lists: Create Python Lists, Update Python Lists, Delete Elements from Python Lists, and Built-in Functions Methods for Python Lists. Tuples: create, update, join and methods; Sets: create, add/remove items, join sets, set methods; Dictionary: create, access, add/remove items, dictionary methods. Manipulating, Strings - Working with Strings, Useful String Methods, Python Functions: defining function, arbitrary arguments, keywords arguments, default parameter values, return value and return statements; Lambda; Arrays: looping through array elements, array methods;	15/CLO ₂
Practical	Practicum: • Write a program to compute distance between two points taking input from the user (Pythagorean Theorem). • Write a program add.py that takes 2 numbers as commandline arguments and prints its sum. • Write a Program for checking whether the given number is an even number or not. • Using for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, ..1/10. • Create a list and perform the following methods (a) insert () (b) remove () (c) append() (d) len() (e) pop () (f) clear () • Create a dictionary and apply the following methods: • Print the dictionary items (b) access items (c) use get () (d) change values (e) use len() • Create a tuple and perform the following methods: (a) Add items (b) len() (c) check for item in tuple (d) Access items • Write a python program to print a number is positive/negative using if-else. • Write a python program to find largest number among three numbers. • Write a python Program to read a number and display corresponding day using if-else-if? • Write a program to create a menu with the following options: (a) To perform addition (b) To perform subtraction (c) To perform multiplication (d) To perform division • Accepts users input and perform the operation according by Use functions with arguments. • Write a python program to check whether the given string is palindrome or not. • Write a python program to find factorial of a given number using functions • Write a Python function that takes two lists and returns True if they are equal otherwise false.	30/CLO ₃

	• Demonstrate a python code to print try, except and finallyblock statements. • Write a Python script that prints prime numbers less than20. Write a python program to find factorial of a number.				
	Contact Hours				60
Evaluation Methods					
Internal Assessment:20	TH-15	PR-5	End Term Examination:55	TH-35	PR-20
• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstrati on/Viva-voce/Lab records etc.:	NA	5	Written Examination	35	NA
• Mid-Term Exam:	5	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Recommended Books/e-resources/LMS: • Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755. • Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition,Wiley India Pvt Ltd. ISBN-13: 978-8126556014. • Wesley J Chun, “Core Python Applications Programming”, 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365. • Reema Thareja, “Python Programming using problem solving approach”, Oxford University press, 2017. ISBN-13: 978-0199480173 • Charles R. Severance, “Python for Everybody: Exploring Data Using Python 3”,1st Edition, Shroff Publishers, 2017. ISBN: 978-9352136278					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Part A–Introduction			
Name of the Programme	Computer Science		
Semester	I		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Introductory Course in R		
Course Code	26L4.5-SEC-CSE-105		
Course Type	SEC		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - Describe the features of R Programming. Use the various data structures in R. CLO ₂ - Apply data frames, control statements and functions for the simulation, Identify the statistical methods applied in R. CLO ₃ - understand the basic concepts of R Programming practically.		
	Theory	Practical	Total
Credits	2	1	3
Teaching hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Duration (in Hours)	2	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.			
<u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
I	Introducing to R, Installation of Libraries; Constants and Variables; Numbers; R Data Structures, Help functions in R. Vectors: Numeric Vectors, Scalars, Declarations Vectorized operation: Using all and any, NA and NULL values, Filtering, Vectorized if-then else, Vector Equality, Vector Elementnames, Arithmetic and Boolean operations, conditional and loop statement in R. Functions and Recursions in R, Packages in R. Creating matrices, Matrix operations, Applying Functions to Matrix Rows and Columns: Adding and deleting rows and columns, Higher Dimensional arrays; Vector/Matrix Distinction; Avoiding Dimension Reduction; Characters and Strings; String vector; String operations and functions.		15/CLO ₁

II	List: Creating lists, General list operations, accessing list components and values, applying functions to lists, recursive lists, Different R operations using a List, matrix, Array. Overview on Data Frames: Create it in scratch, Matrix-like operations in frames, Merging Data Frames, Applying functions toData frames. Factors and Tables: factors and levels, Common functions used with factors, working with tables, Math and Simulations in R, reading a datafile directly into a data frame, EDA using R, Reading different file formats. Input/Output: reading and writing files, String Manipulation. Statistical analysis: Basic Statistical function, Linear Model, R functions for statistical analysis	15/CLO ₂			
Practical	Practicum: Spread Sheet: • Perform arithmetic operations in R. • Demonstrate the process of creating a user defined function in R. • Perform logical operations in R. • Implement Loops with different examples. • Learn the basics of functions in R and implement with examples. • Implement data frames in R. Write a program to join columns and rows in a data frame using c bind () and r bind() in R. • Implement different String Manipulation functions in R. • Implement different data structures in R (Vectors, Lists,Data Frames) • Write a program to read a csv file and analyze the data in the file in R • Create a data set and do statistical analysis on the data using R	30/CLO ₃			
	Contact Hours	60			
Evaluation Methods					
Internal Assessment:20	TH-15	PR-5	End Term Examination:55	TH-35	PR-20
• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	35	NA
• Mid-Term Exam:	5	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Recommended Books/e-resources/LMS:					
• Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011 • Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley Data& Analytics Series, 2013. • Mark Gardener, “Beginning R – The Statistical Programming Language”, Wiley, 2013 • Robert Knell, “Introductory R: A Beginner's Guide to Data Visualization, Statistical Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013.					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	2	3	2	3	3	3	1	2	3	3
CLO ₃	2	3	3	3	3	1	3	3	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Part A–Introduction			
Name of the Programme	Computer Science		
Semester	I		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Computer Programming in C		
Course Code	26L4.5-SEC-CSE-106		
Course Type	SEC		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - understand the basic concepts of C Programming CLO ₂ - It also cover the concept of core programming like how to implement functions, arrays and how to manage data in files using different operations. CLO ₃ - Understand the basic concepts of C Programmingpractically.		
	Theory	Practical	Total
Credits	2	1	3
Teaching hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Duration (in Hours)	2	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.			
<u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
I	Introduction to C: Data Types: Primitive Data types, DerivedData types, User-Defined Data Types. Operators: Different Types of Operators, Precedence of Operators, Expression and Statements. Token: Variables, Constants, Literals, Identifiers, Keyword, Escape Sequence; Types of Conversion: Typecasting, Conversion. Decision Control Statements: IF, IF-ELSE, Nested IF, IF- ELSE ladder, Switch-case; Iterative statements: FOR loop, WHILE loop, DO-WHILE loop; Jump Statements: Break, Continue.		15/CLO ₁

II	Array: Declaration of an Array, Initialization of Array, Type of Array: Single Dimension Array, Two-Dimensional Array; Address Calculation of an Element in Array. Character Array and Strings: Reading, writing, String Handling Functions: strcat(), strcmp(), strcpy(), strlen(). Functions: User-Defined Functions; Function Declaration; Types of Arguments: Actual Arguments, Formal Arguments; Function Definition; Methods to Call a Function: Call by Value, Call by Reference; Passing Arrays as Parameters. Storage classes: Automatic, Register, Static, and External Structures; Unions; Enumerations.	15/CLO ₂
Practical	- Given the values of the variables x, y and z, write a program to rotate their values such that x has the value of y, y has the value of z, and z has the value of x - The distance between two cities (in Km) is input through the keyboard. Write a C program to convert and print this distance in meter, feet, inches and centimeter. - If a five-digit number is input through the keyboard, write a C program to calculate the sum of its digits without using loop. - If a four-digit number is input through the keyboard, write a C program to obtain the sum of the first and last digit of this number. - Program to find largest and smallest number from four given number. - Program to find whether a year is leap or not. - Program to find out the grade of a student when the marks of 5 subjects are given. - A library charges a fine for every book returned late. For first 5 days the fine is 50 paise, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a program to access the number of days the member is late to return the book and display the fine or the appropriate message. - Write a C program in which enter any number by the user and perform the operation of Sum of digits of entered number. - Write a C Program to convert Decimal number to Binary number. - WAP to compute the sum of the first n terms of the following series $S = 1 + 1/2 + 1/3 + 1/4 + \dots$ - Write a C program to perform the factorial of given number. - WAP to enter an integer array of size 10 and perform following operations on it. a) Display the Elements. b) Calculate the Sum and Average of Array. c) Find largest element. d) Find second largest element. e) Find the Smallest element. f) Display the Array in Reverse order. g) Exit - WAP to display Fibonacci series (i) using recursion, (ii) using iteration	30/CLO ₃

	- Write a menu driven program to perform following operations on strings: - Show address of each character in string - Concatenate two strings without using strcat function. - Concatenate two strings using strcat function. - Compare two strings - Calculate length of the string (use pointers) - Convert all lowercase characters to uppercase - Convert all uppercase characters to lowercase - Calculate number of vowels Reverse the string				
	Contact Hours	60			
Evaluation Methods					
Internal Assessment:20	TH-15	PR-5	End Term Examination:55	TH-35	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	35	NA
Mid-Term Exam:	5	NA	Write-up and execution of the practical	NA	10
Part C-Learning Resources					
Recommended Books/e-resources/LMS: - Yashwant Kanetkar, "Let us C", BPB Publications, 2002 E. Bala Guruswamy, "Programming in ANSI C", TMH, 1999. - Al Kelly and Ira Pohl, "A Book on C", (4th Ed.), Addison Wesley, 1999. B. Kernighan and D. Ritchie, "The ANSI C Programming Language", PHI, 2000. - Kernighan & Ritchie, "The C Programming Language ANSI C Version", Prentice Hall Software Series - Herbert Schildt "ANSI C - Made Easy", Osborne McGraw-Hill					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Part A–Introduction			
Name of the Programme	Computer Science		
Semester	II		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Cloud Computing Skills		
Course Code	26L4.5-SEC-CSE-207		
Course Type	SEC		
Course Level	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - Get acquainted with the term Cloud computing. Understand various types of free and commercial clouds. CLO ₂ - Understands various types of cloud services like SaaS. PaaS and IaaS. CLO ₃ - to create and use Cloud.		
	Theory	Practical	Total
Credits	2	1	3
Teaching hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Duration (in Hours)	2	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units. <u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
I	Basic Concepts of Cloud Computing Computer Network Basics. Concepts of Distributed Systems. Concepts of Cloud Computing and its Necessity. Cloud Service Providers in use and their Significance. Cloud Infrastructure Cloud Pros and Cons. Cloud Delivery Models. Cloud Deployment Models.		15/CLO ₁
II	Cloud Storage Management Concept of Virtualization and Load Balancing. Overview on Virtualization used for Enterprise Solutions. Key Challenges in managing Information. Identifying the problems of scale and management in big data. Building Cloud Networks Designing and Implementing a Data Center-Based Cloud Installing Open Source Cloud service. Amazon Web Services (AWS). Google Cloud Platform.		15/CLO ₂

Practical	Practicum: Spread Sheet: - Creating & using Amazon(AWS) Account - Creating & using Google Account	30/CLO ₃
	Contact Hours	60

Evaluation Methods					
Internal Assessment:20	TH-15	PR-5	End Term Examination:55	TH-35	PR-20
• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	35	NA
• Mid-Term Exam:	5	NA	Write-up and execution of the practical	NA	10

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Cloud Computing: Concepts, Technology & Architecture By Thomas Erl, Ricardo
- Cloud computing a practical approach Anthony T. Velte, Toby J. Velte Robert Elsenpeter, TATA McGraw-Hill, New Delhi– 2010
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online -Michael Miller-Que2008
- Moving to Cloud by Dinkar Sitaram, Geetha Manjunath, Publication: Syngress Elsevier Inc, 2014(2nd Edition)
- Cloud Computing Second Edition by Dr Kumar Saurabh , Publication Willy INDIA (2013)
- Cloud Computing Bible by Barrie Sosinsky, Publisher Willy INDIAI (2014)
- Cloud computing for Dummies- Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, Wiley Publishing, Inc, 2010
- Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	1	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	3	3	1	3	3	3	1	2	3	3
CLO ₃	3	3	3	3	3	3	3	3	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Part A–Introduction			
Name of the Programme	Computer Science		
Semester	III		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Advance IT Skills		
Course Code	26L4.5-SEC-CSE-305		
Course Type	SEC		
Course Level	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ - Use e-Governance applications; and use computer to improve existing skills and learn new skills CLO ₂ - Understand the concept of Cyber security and issues and challenges associated with it CLO ₃ - to understand the various concepts in the syllabi practically.		
	Theory	Practical	Total
Credits	2	1	3
Teaching hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Duration (in Hours)	2	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u> The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units. <u>Instructions for Practical Examiner</u> Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Unit	Topics		Contact Hours/ CLOs
I	WWW and E-Governance - Website Address and URL, Introduction to IP, Address, ISP and Role of ISP, Internet Protocol, Modes of Connecting Internet (Hot Spot, Wi-Fi, LAN Cable, Broad Band, USB Tethering), Identifying and uses of IP/MAC/IMEI of various devices, Downloading Web Pages, Printing Web Pages Introduction to Blogs, Basics of E-commerce, Netiquettes, Overview of e-Governance Services like Railway Reservation, Passport, e Hospital [ORS], Accessing e-Governance Services on Mobile		15/CLO ₁

	Digital Financial Tools and Applications Digital Financial Tools, Understanding OTP [One Time Password]and QR [Quick Response] Code, UPI [Unified Payment Interface], AEPS [Aadhaar Enabled Payment System], USSD [Unstructured Supplementary Service Data], Card [Credit / Debit], e Wallet, PoS [Point of Sale], Internet Banking, National Electronic Fund Transfer (NEFT), Real Time Gross Settlement (RTGS), Immediate Payment Service (IMPS), Online Bill Payment	
II	Cyber Security: Cyber Security, Defining Cyberspace, Architecture of cyberspace, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security. Classification of cybercrimes, Common cybercrimes- cybercrime targeting computers and mobiles, cybercrime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offences, Organisations dealing with Cybercrime and Cyber security in India. Overview of Future skills: Introduction to Internet of Things (IoT), Big Data Analytics, Cloud Computing, Virtual Reality, Artificial Intelligence, Social & Mobile, Block chain Technology, 3D Printing/ Additive Manufacturing, Robotics Process Automation.	15/CLO ₂
Practical	Practicum: Spread Sheet: WWW and E-Governance: - Understanding the various devices related to Internet - Using e-governance services - Writing e-blogs. Digital Financial Tool: - Using digital financial tools. Cyber Security: - Check list for reporting cyber-crime at Cyber crime Police Station - Check list for reporting cybercrime online - Reporting phishing emails - Demonstration of email phishing attack and preventive measures. Futuristic Technology: - Introducing various futuristic technologies.	30/CLO ₃
	Contact Hours	60

Evaluation Methods

Internal Assessment:20	TH-15	PR-5	End Term Examination:55	TH-35	PR-20
• Class Participation:	5	0	Lab record	NA	05
• Seminar/presentation/ assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
• Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	35	NA
• Mid-Term Exam:	5	NA	Write-up and execution of the practical	NA	10

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Cyber Crime Impact in the New Millennium, by R.C Mishra, Author Press. Edition 2010.
- Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
- Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry Oliver, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001)
- Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt. Ltd.
- Computer Fundamentals- By Pradeep K. Sinha, Priti Sinha, BPB Publications, 6th Edition

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	2	3	3	3	3	2	3	2
CLO ₂	3	2	3	3	2	3	3	3	2	3	3
CLO ₃	3	3	1	3	3	3	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	60
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	60

Vocational Courses (VOC)

(Computer Science)

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING INDIRA
GANDHI UNIVERSITY, MEERPUR, REWARI**

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	IV		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Graphic Designing		
Course Code	26 L5.0-VOC-CSE-401		
Course Type	VOC (Core Course)		
Course Level	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Perform basic to intermediate image correction to existing images CLO ₂ : Enhance images using advance editing tools to create magazine covers CLO ₃ : Work with the Type tools and panels to type, insert and manage text CLO ₄ : Design various types of documents / cards /logos/etc.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Elements of design- Types of Lines, Line Compositions, Different types of Shapes-Geometric, Organic, Free-form, Natural, and Shape, composition, Positive &Negative. Textures- Physical &Visual, Texture Composition, Form Space-Positive &Negative		15/CLO ₁
II	Introduction to Photoshop: The Photoshop Interface, setting up a new Photoshop document, Saving a new document, The Default Palettes, Working with Photoshop Palettes, The Photoshop Toolbox and Options bar, Using Guides and Ruler, Supported import in export image formats, Opening an Image in Photoshop, Creating Images in Photoshop, Saving Images in Photoshop, Basic Image Editing, Changing Image Size, Cropping an Image, Changing		15/CLO ₂

	Color/Bit Depth, Optimizing Images using Save for Web, Working with Color in Photoshop. Photoshop Tools Move tool, Crop tool, Slice tools, Pencil, Paintbrush, Eraser tools, History brushes, Clonetamp-Pattern stamp, healing brush tool, Retouch tool, Gradient, Paint bucket, Burn- DodgeSponge, Blur-Sharpen-Smudge, Shapes-Line rectangle- polygon-custom shapes,				
III	Photoshop Tools Path, selection tool, Pen tool, Type tools, Notes Tool-Audio annotation, Eyedropper-Color sampler Measure tool, Hand-Zoom, Quick Mask-Screen modes, Jump to Image Ready, Back ground and Foreground. Photoshop Layers About Layers-Fill and adjustment layers, The Layer Palette, Naming Layers, Creating Layers, Deleting Layers, Viewing Layers, Moving Layers, Layer Opacity, Locking Layers, Merging Layers, Layer modes and blending options, Image composting using layers.	15/CLO ₃			
Practical	Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: • Use basic selection tools and edge refinement to isolate and edit parts of an image. • Manipulate layers through ordering, positioning, scaling, rotation, and adjustments. • Create composite images that demonstrate advanced selection and layering techniques. • Prepare images for Web and print output with appropriate sizing and resolution. • Apply painted masks, selection-based masks, gradient masks, and blend modes to create sophisticated image effects. • Create adjustment layers for editable, non-destructive changes to image coloration and exposure. • Set and modify typography using the full range of type tools, the Character panel, and the Paragraph panel. • Apply special effects to typography using masks, paths, and layer styles. • Use preset brushes and custom brushes to colorize images, enhance images, and build illustrations.	30/CLO ₄			
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C - Learning Resources					
Recommended Books/e-resources/LMS: • Adobe Photoshop Bible, Dayley and Dayley, Wiley India Publication. • Photoshop in Easy Steps 1st Edition (Paperback), Robert Shufflebotham, Tata McGraw-Hill Publication. • Adobe Photoshop-Classroom in a Book 1st Edition, Adobe Creative Team, Pearson Publication.					

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	IV		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	3-D Graphics		
Course Code	26 L5.0-VOC-CSE-402		
Course Type	VOC (Core Course)		
Course Level	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Understand the fundamental concepts of computer graphics. CLO ₂ : Understand the 3-D transformation of images. CLO ₃ : Understand the Concepts of viewing in 3-D. CLO ₄ : To implement the various graphics elements.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays.		15/CLO ₁
II	Three-Dimensional Transformations: Three-Dimensional Scaling, Three-Dimensional Shearing, Three- Dimensional Rotation, Three-Dimensional Reflection, Three- Dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models,		15/CLO ₂

	Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections.				
III	Viewing in 3D: Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid. Visible-Surface Determination: Techniques for efficient Visible- Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter’s algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.	15/CLO ₃			
Practical	Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Study and enlist the basic functions used for graphics in C / C++ / Python language. Give an example for each of them. • Draw a co-ordinate axis at the center of the screen. • Divide your screen into four regions, draw circle, rectangle, ellipse and half ellipse in each region with appropriate message. • Draw a simple hut on the screen. • Draw the following basic shapes in the center of the screen i. Circle ii. Rectangle iii. Square iv. Concentric Circles v. Ellipse vi. Line • Program to create a house like figure and perform the following operations. i. Scaling about the origin followed by translation. ii. Scaling with reference to an arbitrary point. • Reflect about the line $y = mx + c$. • Develop a simple text screen saver using graphics functions. • Perform smiling face animation using graphic functions.	30/CLO ₄			
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C - Learning Resources					
Recommended Books/e-resources/LMS:					
• Computer Graphics - Principles and Practice, J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Pearson • Fundamentals of Computer Graphics, Steve Marschner, Peter Shirley, CRC press • Computer Graphics, Hearn, Baker, Pearson • Principles of Interactive Computer Graphics, William M. Newman and Robert F. Sproull, TMH • Mathematical Elements for CG, D. F. Rogers, J. A. Adams, TMH					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	IV		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Software Testing		
Course Code	26 L5.0-VOC-CSE-403		
Course Type	VOC (Core Course)		
Course Level	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : To understand the basic terminologies and types of testing. CLO ₂ : Understand different testing methods CLO ₃ : Manage the tests, plan testing process and create reports CLO ₄ : Testing the software/projects using various techniques		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Introduction: Definition of Software Testing and its Role, Terms: - Failure, Error, Fault, Defect, Bug, Goals of Testing, Principles of Testing, Software Testing Life Cycle, Verification and Validation: - V-testing Life cycle		15/CLO ₁
II	Types of Testing: Black Box Testing: Overview: What is & When? Techniques: Boundary Value Analysis, Equivalence class testing, Decision Table White Box Testing: What is white box Testing, Need of white box Testing, Classification , Structural : Coverage, Path testing		15/CLO ₂
III	Levels of Testing Unit Testing : Overview, Integration Testing : Overview, Techniques: Graph based & Path based, Functional Testing, System Testing : Overview, Categories: Reliability Security Performance Recovery, Acceptance Testing : Overview, Types of Acceptance Testing Test Planning: Preparing a Test plan, Scope management, Decide Test		15/CLO ₃

	Approach, Setting Up Criteria, for testing, Identifying responsibilities, Staffing, training needs, Resource requirements, Test deliverables, Testing Tasks	
Practical	Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: 1. Prepare a small project and submit SRS, design, coding and test plan. 2. Study of any one of the testing tools. (e.g win runner, test direct, etc) 3. MANUAL TESTING for the project a. Whitebox Testing b. Blackbox Testing 4. Functional Testing a. Boundary value Testing b. Equivalence class testing 5. Structural Testing a. Path testing b. Data-flow testing	30/CLO ₄
	Contact Hours	75
Evaluation Methods		
Internal Assessment	TH-25	PR-5
Class Participation:	5	0
Seminar/presentation/assignment/quiz/class test etc.:	5	NA
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5
Mid-Term Exam:	15	NA
End Term Examination:70		
Lab record	NA	05
Viva-Voce	NA	05
Written Examination	50	NA
Write-up and execution of the practical	NA	10
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
- Software Testing: Principles and Practice by Srinivasan Desikan, Gopalaswamy Ramesh, Pearson Publication - Software Testing: Principles and Practice by Naresh Chauhan, Oxford - Software Testing: Easy Learning Approach by Shubha Agarwal Kundlas		

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	V		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Animation		
Course Code	26 L5.5-VOC-CSE-501/ 26 L5.0-VOC-CSE-301		
Course Type	VOC (Core Course)		
Course Level	300-399/200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Understand the basic idea of 2-D animation. CLO ₂ : Using Photoshop for animation. CLO ₃ : Using Corel-Draw and paint for animation CLO ₄ : Implementing the animation using Photoshop, Corel-Draw, Paint and Flash.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Introduction to 2D Animation: Basic of sketching, still life and assignment of basic drawing, Composition of basic elements, Creating Digital Layout, Working with visual images, Paint & animate (scanning, tracing, ink & Paint) Drawing concept, Work in different media, such as drawing, collage, and painting.		15/CLO ₁
II	Professional image editing (PHOTOSHOP), Story Boarding, Understanding Background composition , Colour theory & basics, Explore the relationship between elements and principal, Advertising and relevant case ,Graphics and illustration (Corel Draw, Paint), Titles and Credit Making, Basic Understanding of 2D animation and technique.		15/CLO ₂
III	Incorporating sound into 2D animation, Pixel and resolution: Vector and Bitmap Graphics, Vector Composition, 2D animation (Macromedia Flash), Stop motion animation, Animation with flash, Portfolio Making.		15/CLO ₃
Practical	Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: - Drawing fundamentals using lines - Sketching of cartoon characters 2D Logo designing		30/CLO ₄

	• Story boarding of a 30 seconds film • Portfolio making of an organization				
	Contact Hours				75
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C - Learning Resources					
Recommended Books/e-resources/LMS:					
• The Illusion of Life: Disney Animation, Ollie Johnston and Frank Thomas, Disney Editions. • Blender Production Creating Short Animations from Start to Finish, Roland Hess, Routledge. • Animating with Blender: Creating Short Animations from Start to Finish, Roland Hess, Focal Press • Simplified Drawing for Planning Animation, Wayne Gilbert, Anamie Entertainment Ltd. • Creating Characters with Personality: For Film, TV, Animation, Video Games, and Graphic Novels, Tom Bancroft, Watson-Guption • Force: Dynamic Life Drawing for Animators, Mike Mattesi, Focal Press					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	V		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Web Designing		
Course Code	26 L5.5-VOC-CSE-502/ 26 L5.0-VOC-CSE-302		
Course Type	VOC (Core Course)		
Course Level	300-399/200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Understand the fundamental concepts of web development CLO ₂ : Understand the basic tags of HTML CLO ₃ : Understand the Concepts of CSS CLO ₄ : To understand the designing of a static websites.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Web Programming Introduction: Architecture of a website, Different technologies in making the website; Introduction to HTML: History of HTML, Basic structure of an HTML document, Introduction to Static and Dynamic Websites, HTML Tag vs Element, HTML Attributes; HTML-Basic Formatting Tags; Grouping Using Div and Span, HTML-Lists: Unordered Lists, Ordered Lists, Definition list; Image and Image Mapping, Hyperlink.		15/CLO ₁
II	HTML-Table: < table >, < th >, < tr >, < td >, < caption >, < thead >, < tbody >, < tfoot >, < colgroup >, < col >; Colspan & Rowspan HTML-Iframe: Iframe attributes, Using Iframe as the Target; HTML-Form: Form attributes, Form elements: < input >, < textarea >, < button >, < select >, < label >, <fieldset>, <legend> etc.		15/CLO ₂
III	CSS: Introduction, Benefits of CSS, CSS Syntax, Types of CSS, CSS Selectors: Element selector, ID Selectors, Class Selectors, Grouping Selectors, Universal Selector, CSS - Pseudo Classes, pseudo element; Text Fonts: color, background-color, text-decoration, text-align, vertical-align,		15/CLO ₃

	text-indent, text-transform, white space, letter-spacing, word- spacing, line-height; font properties: font-family, font-size, font-style, font-variant, font-weight. Lists: list-style-type, list-style-position, list-style-image, list- style Tables: border, width & height, text-align, padding, colour; CSS Box Model: Border, Margin & Padding, width & height; CSS Positioning properties: Static Positioning, Fixed Positioning, Relative Positioning, Absolute Positioning.				
Practical	Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Web Designing: - Starting with introduction to WWW HTML: - Write a HTML document to print "Hello World" in bold and Italic Format. - Design a page having suitable background colour and text colour with title “My First Web Page” using all the attributes of the Font tag. - Write HTML code to design a page containing some text in a paragraph by giving suitable heading style. - Write HTML code to display three images at LEFT, RIGHT and CENTER respectively in web browser. - Write HTML code which contains Hyperlinks. - Program based on HTML form and frames Design a HTML table with the use of colspan and row span. CSS: Practical based on CSS	30/CLO ₄			
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C - Learning Resources					
Recommended Books/e-resources/LMS: - Deitel H.M., Deitel P.J., Internet & World wide Web: How to program, Pearson Education. - Jackson, Web Technologies, Pearson Education					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A–Introduction			
Name of the Programme	Computer Applications		
Semester	VI		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Mobile Application Designing		
Course Code	26 L5.5-VOC-CSE-601		
Course Type	VOC (Core Course)		
Course Level	300-399		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Know the components and structure of mobile application development frameworks for Android based mobiles; CLO ₂ : Design and implement the user interfaces of mobile applications. CLO ₃ : Implement fragments in Android application; CLO ₄ : Understand the designing of a mobile application.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Introduction: Mobile Applications, Characteristics and Benefits, Application Models, Mobile devices Profiles. Basics of Android, Importance and scope, Android Versions, Features of Android, Android Architecture, Android Stack, Android Applications Structure, Android Emulator, Android SDK, Overview of Android Studio, Android and File Structure, Android Virtual Device Manager, DDMS, LogCat.		15/CLO ₁
II	Android User Interface: Measurements – Device and pixel density independent measuring units. Layouts – Linear, Relative, Grid and Table Layouts. User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers, List View, Spinner View.		15/CLO ₂

III	Event Handling – Handling clicks or changes of various UI components. Intents and Broadcasts: Intent – Using intents to launch Activities, explicitly starting new Activity, Implicit Intents Services- Callbacks and Override in application, Application Signing, API keys for Google Maps, Publishing application to the Android Market. Fragments – Creating fragments, Lifecycle of fragments, Fragment states, adding fragments to Activity, adding, removing and replacing fragments with fragment transactions;Introduction to SQLite database	15/CLO ₃			
Practical	Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: • Create “Hello World” application. That will display “Hello World” in the middle of the screen in the emulator. Also display “Hello World” in the middle of the screen in the Android Phone. • Create an application with three buttons (increment, decrement and reset) and a textView aligned vertically. On clicking, increment/decrement button, the value of the textview should increment/decrement by 1while selecting reset button, the value of textview should become zero. • Create an application with login module. (Check username and password). • Create an application to display various activity life cycle methods. • Create an application using explicit Intents. • Create an application using implicit Intents. • Create an application to display various fragment life cycle methods. • Create an application with 2 fragments, one to set the background and other to set the fore-color of the text.	30/CLO ₄			
	Contact Hours	75			
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C - Learning Resources					
Recommended Books/e-resources/LMS: • Zigurd Mednieks, Laird Dornin, G,BlakeMeike and Masumi Nakamura, Programming Android, O'Reilly Publications. • Wei-Meng Lee, Beginning Android Application Development, Wiley India Ltd. • James C.S., Android Application development for Java Programmer, CENGAGE Learning. • Pradeep Kothari, Android Application Development: Black Book, Wiley India Ltd. • Gargenta M., Nakamura M., Learning Android, O'Reilly Publications.					

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	VI		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Analytics with Python		
Course Code	26 L5.5-VOC-CSE-602		
Course Type	VOC (Core Course)		
Course Level	300-399		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ :Learn basic statistics needed for data analytics CLO ₂ : Use data analysis tools in the pandas library. CLO ₃ : Create informative visualization and summarize data sets. CLO ₄ : Solve real world data analysis problems.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Introduction to basic statistics and analysis: Fundamentals of Data Analysis, Statistical foundations for Data Analysis, Types of data, Descriptive Statistics, Python Libraries: NumPy, Pandas, Matplotlib Correlation and covariance, Linear Regression, Statistical Hypothesis Generation and Testing		15/CLO ₁
II	Array manipulation using NumPy: NumPy array: Creating NumPy arrays, various data types of NumPy arrays, Indexing and slicing, swapping axes, transposing arrays, data processing using Numpy arrays Plotting and Visualization: Using Matplotlib to plot data: figures, subplots, markings, color and line styles, labels and legends, Plotting functions in Pandas: Lines, bar, Scatter plots, histograms, stacked bars, Heatmap		15/CLO ₂
III	Data Manipulation using Pandas: Data Structures in Pandas: Series, Data Frame, Index objects, loading data into Panda's data frame, Working with Data Frames: Arithmetic, Statistics, Binning, Indexing, Reindexing, Filtering, Handling missing data, Hierarchical indexing, Data wrangling: Data cleaning, transforming, merging and reshaping.		15/CLO ₃
Practical	Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:		30/CLO ₄

Use data set of your choice from Open Data Portal (https://data.gov.in/) for the following exercises, wherever datasets are not mentioned explicitly. 1. Make visual representations of data using library Matplotlib and apply basic principles of data graphics to create rich analytic graphs for available datasets. 2. Use boston house-prices dataset available with sklearn library to do the following for: i. Generate box whisker plots for price and age of the owner ii. Identify outliers, if any iii. Display 5-point summary of data distribution for all attributes iv. Find if there is any missing value in data or not v. Find pairwise correlation between attributes vi. Use scatterplot to show relationship between each feature w.r.t target class in a single panel for comparison 3. Create a CSV file having employee data records. Each employee record has three features viz. age, home city and salary. Import employee file and: i. Draw scatter plot for age vs salary ii. Plot histogram for features age and salary iii. Plot Pie chart for the qualitative attribute city iv. Generate box plots for salary and age 4. Import iris data using sklearn library to: i. Compute mean, mode, median, standard deviation, confidence interval and standard error for each feature ii. Compute correlation between length and width of sepal feature. iii. Find covariance between length of sepal and petal iv. Build contingency table for class feature 5. Download datasets Hepatitis and automobile from UCI repository i. Find the number of records which are noise free ii. Clean data after removing noise iii. Normalize quantitative features in range of [0,1] iv. Compare frequency distribution for any two columns by plotting histograms for any two columns in the same plot 6. Do the following using iris CSV file (use of Pandas/NumPy/SciPy) i. Find total number of records and columns in a csv file ii. Find correlation and contingency table for any two variables iii. Find the column with maximum variance iv. Draw scatter plot for any two columns and also write their correlation in the caption of scatter plot 7. Use car dataset from UCI repository (https://archive.ics.uci.edu/ml/machine-learning-databases/car/) i. Find the most popular car and draw appropriate plot to justify your answer ii. Plot bar chart to compare capacity of any two cars along with their cost iii. Draw word cloud for car names and export to a file					
Contact Hours					75
Evaluation Methods					
Internal Assessment	TH-25	PR-5	End Term Examination:70	TH-50	PR-20
Class Participation:	5	0	Lab record	NA	05
Seminar/presentation/assignment/quiz/class test etc.:	5	NA	Viva-Voce	NA	05
Seminar/Demonstration/Viva-voce/Lab records etc.:	NA	5	Written Examination	50	NA
Mid-Term Exam:	15	NA	Write-up and execution of the practical	NA	10
Part C - Learning Resources					

Recommended Books/e-resources/LMS:

- McKinney, W. (2017). Python for Data Analysis. Second edition, O'reilly (SPD).
- Grus, J. (2016). Data Science from scratch. First edition, O'reilly (SPD).
- VanderPlas, J. (2016). Python Data Science Handbook: Essential Tools for Working with Data. Second edition, O'reilly (SPD).
- Mode: use mode function of pandas
(<https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.mode.html>)
- Contingency table using crosstab function : use crosstab function
<https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.crosstab.html>
- Links for Examples on Word clouds:
<https://www.datacamp.com/community/tutorials/wordcloud-python>
<https://www.tutorialspoint.com/create-word-cloud-using-python>
<https://www.geeksforgeeks.org/generating-word-cloud-python/>

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75

Part A-Introduction			
Name of the Programme	Computer Applications		
Semester	VI		
Nature of Course/Course Composition	Theory + Practical		
Name of the Course	Data Analytics with R		
Course Code	26 L5.5-VOC-CSE-603		
Course Type	VOC (Core Course)		
Course Level	300-399		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLOs) After completing this course, the learner will be able to:	CLO ₁ : Develop an R script for data analysis and execute it. CLO ₂ : Analyse the data stored in files in different formats. CLO ₃ : Identify suitable data visualization and exploration methods to answer a business question. CLO ₄ : Interpret the results of analysis.		
	Theory	Practical	Total
Credits	3	1	4
Teaching hours per week	3	2	5
Internal Assessment Marks	25	5	30
End Term Exam Marks	50	20	70
Max. Marks	75	25	100
Examination Duration (in Hours)	3	2	
Part B-Contents of the Course			
<u>Instructions for Theory Paper-Setter</u>			
The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units.			
<u>Instructions for Practical Examiner</u>			
Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.			
Units	Topics		Contact Hours/ CLOs
I	Introduction to Programming Structures: R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Flow control and loops, looping over list and array, user- defined functions		15/CLO ₁
II	File Handling: Installing, loading and using packages for reading data from file Data Preprocessing and Transformation: Handling of missing data, Data cleaning and transformation.		15/CLO ₂
III	Data Exploration: Exploring data using statistical methods: mean, median, mode, quantiles. Building contingency table, correlation, co- variance. Plotting Data: Data visualization using Scatter plot, Line graph, Histogram, Boxplot, and other plots in R used for data visualization.		15/CLO ₃
Practical	Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: 1. Find measures of central tendencies for the given data.		30/CLO ₄

	2. Draw the box plot for the given data and analyse skewness. 3. Randomly generate 30 numbers in the range of 1 to 40 and do the following a) Generate box plot b) Identify outliers, if any c) Display 5-point summary of data distribution Use data set of your choice from Open Data Portal (https://data.gov.in/) for the following exercises. - Read the all rows from the CSV file, with header. Write an R script to: a) create a subset of the data records that satisfy a condition. b) find suitable descriptive statistics for each column. c) draw boxplot for the numeric attributes and identify outliers, if any d) find correlation for each pair of numeric attributes, and draw scatter plot matrix. e) draw histograms, pie charts for categorical attributes. f) draw the probability density curve for numeric attributes. - Read the CSV file, without headers and a. Find the number of records which are noise free b. Clean data after removing noise c. Normalize quantative features in range of [0,1] - Practical based on vectors, arrays and lists, data frames - Practical based on reading/writing data from/to files. - Practical based on data cleaning and transformation - Practical based on linear regression - Practical based on visualizing data as Scatter Plot, line graph, histogram, boxplot, line plots regression, word clouds, and exporting plots as images	
	Contact Hours	75
Evaluation Methods		
Internal Assessment	TH-25	PR-5

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

CLOs	PLO ₁	PLO ₂	PLO ₃	PLO ₄	PLO ₅	PLO ₆	PLO ₇	PLO ₈	PLO ₉	PLO ₁₀	PLO ₁₁
CLO ₁	3	3	3	1	3	3	3	3	2	3	2
CLO ₂	3	3	3	2	3	3	3	2	2	3	3
CLO ₃	2	3	3	3	3	3	3	3	3	3	3
CLO ₄	3	3	2	3	2	2	3	2	3	3	3

Content Mapping with NEP thrust areas

Field	Content/s
Employability/Entrepreneurship	
Skill Enhancement	75
Communication Development	
Indian Knowledge System	
Environmental Awareness	
Current Issues and Social Awareness	
Women empowerment/ Gender issues	
Public policies	
Technology Development	75