FOUR YEAR UNDERGRADUATE PROGRAM (NEP–2020)

Program: Bachelor in Computer Application (2024 -28)

DISCIPLINE – COMPUTER APPLICATION

SESSION – 2024 -25

DSC -01 to 20		DSE -01 to 12	
Code	**Title**	**Code**	**Title**
CASC -01	Discrete Mathematics	CASE -01	Cyber Security and Cyber Law
CASC -02T	Computer Fundamental and MS-Office	CASE -02	Artificial Intelligence and Expert System
CASC -02P	**Lab 1:** MS-Office	CASE -03	Numerical Analysis
CASC -03T	Operating System	CASE -04	Computer System Architecture
CASC -03P	**Lab 2:** Operating System	CASE -05	Computer Graphics
CASC -04	Digital Electronics	CASE -06T	Cloud Computing
CASC -05T	Programming in C++	CASE -06P	**Lab 13:** Cloud Computing
CASC -05P	**Lab 3:** Programming in C++	CASE -07	Cryptography and Network Security
CASC -06T	Data Structure	CASE -08	Advanced Operating systems
CASC -06P	**Lab 4:** Data Structure Using C++	CASE -09	Soft Computing
CASC -07	Software Engineering	CASE -10	Digital Image Processing
CASC -08T	Relational Database Management System	CASE -11	Big Data Analytics
CASC -08P	**Lab 5:** Relational Database Management System (Oracle/MySQL)	CASE -12	Major Project-2
CASC -09T	Programming in Java		
CASC -09P	**Lab 6:** Programming in Java	**DGE -01 & 02**	
CASC -10	Theory of Computation	CAGE -01T	Computer Fundamental and MS-Office
CASC -11T	Web Technology	CAGE -01P	**Lab 1:** MS-Office
CASC -11P	**Lab 7:** Web Technology	CAGE -02T	Operating System
CASC -12T	Python Programming	CAGE -02P	**Lab 2:** Operating System
CASC -12P	**Lab 8:** Python Programming	**VAC**	
CASC -13	Data Mining and Data Warehousing	CAVAC-01	Artificial Intelligence
CASC -14T	Programming in .Net	**SEC**	
CASC -14P	**Lab 9:** Programming in .Net	CASEC-01	ICT Based Learning
CASC -15T	Machine Learning		
CASC -15P	**Lab 10:** Machine Learning		
CASC -16	Data Communication and Computer Networking		
CASC -17T	Advanced Java		
CASC -17P	**Lab 11:** Advanced Java		
CASC -18	Major Project-1		
CASC -19T	Mobile Application Development		

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CASC -19P	**Lab 12:** Mobile Application Development		
CASC -20T	Fundamentals of IoT and Applications		
CASC -20P	**Lab 14:** Fundamentals of IoT and Applications		

Program Outcomes (PO):

- Gain a complete exposure to the theories and practices of Computer Application.
- Get transformed into a skilled learner and active programmer, enabling the students to focus on their higher studies.
- Value computer professionals and programmers.
- Explore how the concepts and applications of Computer lead to innovative thinking with a problem-solving attitude.

Program Specific Outcomes (PSO):

- Understand the basic computer knowledge and concept of operating systems.
- Understanding the concept of programming and develop program in C++.
- Understanding the concept of data structure and implementation with C/C++.
- Understanding the concept of DBMS and implementation in MySQL /Oracle.
- Understanding the concept of OOPs and Java programming and develop program in Java.
- Understanding the concept of web technology and its implementation with HTML/CSS/DHTML/PHP.
- Understand the basic concept of data and computer networks.
- Understanding the basic concept of digital electronics.
- Understanding the basic concept of cyber security and cyber law.
- Understanding the basic concept of Artificial Intelligence.

CURRICULUM STRUCTURE

Scheme

Program: BCA

Discipline: Computer Application

Semester	Course Type	Course Code	Course Title	Total Credit	Total Marks	
					Max	Min
1st Semester	DSC (Major/Core)	CASC-01	Discrete Mathematics	4	100	40
		CASC-02T	Computer Fundamental and MS-Office	3	100	40
		CASC-02P	**Lab 1**: MS-Office	1	50	20
		CASC-03T	Operating System	3	100	40
		CASC-03P	**Lab 2:** Operating System	1	50	20
2nd Semester	DSC (Major/Core)	CASC-04	Digital Electronics	4	100	40
		CASC-05T	Programming in C++	3	100	40
		CASC-05P	**Lab 3:** Programming in C++	1	50	20
		CASC-06T	Data Structure	3	100	40
		CASC-06P	**Lab 4:** Data Structure Using C++	1	50	20
3rd Semester	DSC (Major/Core)	CASC-07	Software Engineering	4	100	40
		CASC-08T	Relational Database Management System	3	100	40
		CASC-08P	**Lab 5:** Relational Database Management System (Oracle/MySQL)	1	50	20
		CASC-09T	Programming in Java	3	100	40
		CASC-09P	**Lab 6**: Programming in Java	1	50	20
	DSE	CASE-01	Cyber Security and Cyber Law	4	100	40
4th Semester	DSC (Major/Core)	CASC-10	Theory of Computation	4	100	40
		CASC-11T	Web Technology	3	100	40
		CASC-11P	**Lab 7**: Web Technology	1	50	20
		CASC-12T	Python Programming	3	100	40
		CASC-12P	**Lab 8:** Python Programming	1	50	20

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	DSE	CASE-02	Artificial Intelligence and Expert System	4	100	40
5th Semester	DSC (Major/Core)	CASC-13	Data Mining and Data Warehousing	4	100	40
		CASC-14T	Programming in .Net	3	100	40
		CASC-14P	**Lab 9**: Programming in .Net	1	50	20
		CASC-15T	Machine Learning	3	100	40
		CASC-15P	**Lab 10:** Machine Learning	1	50	20
	DSE	CASE-03	Numerical Analysis	4	100	40
6th Semester	DSC (Major/Core)	CASC-16	Data Communication and Computer Networking	4	100	40
		CASC-17T	Advanced Java	3	50	20
		CASC-17P	**Lab 11:** Advanced Java	1	100	40
		CASC-18	Major Project-1	4	50	20
	DSE	CASE-04	Computer System Architecture	4	100	40
7th Semester	DSC (Major/Core)	CASC-19T	Mobile Application Development	3	100	40
		CASC-19P	**Lab 12:** Mobile Application Development	1	50	20
	DSE	CASE-05	Computer Graphics	4	100	40
		CASE-06T	Cloud Computing	3	100	40
		CASE-06P	**Lab 13:** Cloud Computing	1	50	20
		CASE-07	Cryptography and Network Security	4	100	40
		CASE-08	Advanced Operating systems	4	100	40
8th Semester	DSC (Major/Core)	CASC-20T	Fundamentals of IoT and Applications	3	100	40
		CASC-20P	**Lab 14:** Fundamentals of IoT and Applications	1	50	20
	DSE	CASE-09	Soft Computing	4	100	40
		CASE-10	Digital Image Processing	4	100	40
		CASE-11	Big Data Analytics	4	100	40
		CASE-12	Major Project - 2	4	100	40

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(Dr. K.B. Dubey)
Dr SK Sahu
(Dr. Anil Sharma)
(H.S.P. Tondi)
(Sushil Kumar Sahu)
(Suresh Thakur)
(Shailendra Arya)
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction

Program: Bachelor of Computer Application *(Certificate / Diploma / Degree/Honors)*	Semester - VIII	Session: 2024-2025

1	Course Code	**CASC-20T**		
2	Course Title	**Fundamentals of IoT and Applications**		
3	Course Type	**DSC (Discipline Specific Course)**		
4	Prerequisite	*As per program*		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand IoT value chain structure (device, data cloud), application areas and technologies involved. • Understand working of sensors. • Understand about technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules • Market forecast for IoT devices with a focus on sensors • Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.		
6	Credit Value	**3 Credits**	*Credit = 15 Hours - Learning & Observation*	
7	Total Marks	**Max. Marks:**	**100**	**Min Passing Marks: 40**

PART -B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Introduction to Internet of Things**- Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.	13
II	**IoT Physical Devices** - Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C). **Controlling Hardware**- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors.	11
III	**Sensors**- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor.	10
IV	**Applications of IoT:** Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.	11
Keywords	*Internet of Things, IOT Sensors, IOT Actuators, Arduino, Raspberry Pi.*	

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(Suresh Thakur)

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
- Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
- Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

Reference Books ***Recommended:***

- Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
- Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
- N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

Online Resources:

- Swayam/NPTEL: https://www.youtube.com/channel/UC6ZY_csXZc7YZZm2W8HcQ6A
- Javatpoint: https://www.javatpoint.com/iot-internet-of-things
- Tutorialspoint: https://www.tutorialspoint.com/internet_of_things/index.htm
- Topics Related to IOT from data-flair: https://data-flair.training/blogs/iot-tutorial/
- Topics Related to IOT from edureka: https://www.edureka.co/blog/iot-tutorial/

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	100 Marks
Continuous Internal Assessment (CIA):	30 Marks
End Semester Exam (ESE):	70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts.,1 out of 2 from each unit-4x10=40 Marks	

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Dr. Suresh Thakur

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor of Computer Application *(Certificate / Diploma / Degree)*			**Semester - VIII**	Session: 2024-2025
1	Course Code	**CASC-20P**		
2	Course Title	**Lab 14: Fundamentals of IoT and Applications**		
3	Course Type	**Practical**		
4	Prerequisite	*As per program*		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand IoT value chain structure (device, data cloud), application areas and technologies involved. • Understand working of IoT sensors. • Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules • Market forecast for IoT devices with a focus on sensors • Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.		
6	Credit Value	**1 Credits**	*Credit =30 Hours Laboratory or Field Learning/Training*	
7	Total Marks	**Max. Marks: 50**	**Min Passing Marks: 20**	

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
List of Practical Experiment	1. Data acquisition using Multimeter and oscillographic recorder 2. Connect an LED to GPIO pin 25 and control it through the command line. 3. Connect an LED to GPIO pin 24 and a Switch to GPIO 25 and control the LED with the switch. 4. The state of LED should toggle with every press of the switch Use DHT11 temperature sensor and print the temperature and humidity of the room with an interval of 15 seconds 5. Use joystick and display the direction on the screen 6. Use Light Dependent Resistor (LDR) and control an LED that should switch-on/off depending on the light. 7. Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds. 8. Switch on and switch of a DC motor based on the position of a switch. 9. Convert an analog voltage to digital value and show it on the screen. 10. Create a door lock application using a reed switch and magnet and give a beep when the door is opened. 11. Control a 230V device (Bulb) with Raspberry Pi using a relay. 12. Control a 230V device using a threshold temperature, using a temperature sensor. 13. Create an application that has three LEDs (Red, Green and white). The LEDs should follow the cycle (All Off, Red On, Green On, and White On) for each clap (use sound sensor). 14. Create a web application for the above applications wherever possible with suitable modifications to get input and to send output. **Note:** Concerned teacher can add additional experiments as per requirement	**30**

Keywords	*Internet of Things, IOT Sensors, IOT Actuators, Arduino, Raspberry Pi.*

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
- Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
- Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

Reference Books ***Recommended:***

- Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
- Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
- N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

Online Resources:

- Swayam/NPTEL: https://www.youtube.com/channel/UC6ZY_csXZc7YZZm2W8HcQ6A
- Javatpoint: https://www.javatpoint.com/iot-internet-of-things
- Tutorialspoint: https://www.tutorialspoint.com/internet_of_things/index.htm
- Topics Related to IOT from data-flair: https://data-flair.training/blogs/iot-tutorial/
- Topics Related to IOT from edureka: https://www.edureka.co/blog/iot-tutorial/
- Lab Manuals:
  - https://www.lnmiit.ac.in/Department/ECE/uploaded_files/Internet_of_Things_Lab_manual.pdf
  - https://www.iare.ac.in/sites/default/files/lab1/IARE_IOT%20LAB%20_MANUAL.pdf
  - https://www.amirajcollege.in/wp-content/uploads/2020/06/2180709-iot_manual.pdf
  - https://peer.asee.org/internet-of-things-iot-laboratory.pdf
  - https://www.teachmint.com/tfile/studymaterial/class-7th/internetofthingsiot/iotlabmanualpdf/d85015cf-722b-4b50-86e4-0f456f91bfa0
  - https://www.slideshare.net/RadheyShyam18/iot-lab-manual-new
  - https://www.psgrkcw.ac.in/wp-content/uploads/2021/08/IoT-Applications-Lab-Manual-IT.pdf
  - https://www.coursehero.com/file/37028140/IoT-Lab-Manualpdf/
  - https://www.scribd.com/document/408744059/IoT-Lab-Manual
  - https://mrcet.com/CSE_downloads.html
  - http://iotmumbai.bharatividyapeeth.edu/index.php/lab-manuals#computer-technology

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	50 Marks
Continuous Internal Assessment (CIA):	15 Marks
End Semester Exam (ESE):	35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks

End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** A. **Performed the Task based on lab. work - 20 Marks** B. **Spotting based on tools & technology (written) – 10 Marks** C. **Viva-voce (based on principle/technology) - 05 Marks**	Managed by Course teacher as per lab. status

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction

Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*		Semester – III	Session: 2024-2025
1	Course Code	**CASE-01**	
2	Course Title	**Cyber Security and Cyber Law**	
3	Course Type	**DSE (Discipline Specific Elective)**	
4	Prerequisite	***As per Program***	
5	Course Learning. Outcomes(CLO)	At the end of this course, students will be able to: • Understand the fundamental concepts in cyber security and distinguish among the attacks, threats and vulnerabilities. • Identify, differentiate and explain different cyber crimes and frauds. • Understand the concept of Cyber security issues and challenges associated with it. • Understand the cyber crimes, their nature, legal remedies and how to report the crimes through available platforms and procedures. • Understand the basic concepts related to E-Commerce and digital payments.	
6	Credit Value	**4 Credits**	***Credit = 15 Hours -Learning & Observation***
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**

PART – B: Content of the Course

Total No. of Teaching– Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No .of Period
I	**Introduction:** Defining Cyberspace, Architecture of cyberspace, Internet, World wide web, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security, Cyber Physical System Security, Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cyber crimes, Remedial and mitigation measures.	**15**
II	**Authentication:** Vulnerability and vulnerability assessment, Intrusion Detection and Intrusion Prevention System, Introduction of Authentication, User Authentication Methods, Biometric Authentication Methods.	**15**
III	**Different Securities:** Window Security, Smartphone Security, Browser Security, Web Security, Email Security, Wi-Fi Security, and Social Media Security: Challenges, opportunities and pitfalls in online social network, Best practices for the use of Social media, Introduction to digital payments, Components of digital payment and stakeholders, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorized banking transactions.	**15**
IV	**Cyber Law Basics:** Information Technology Act 2000-Amendments; Laws regarding posting of inappropriate content, Relevant provisions of Payment Settlement Act 2007, Cybercrimes and offenses dealt with IPC, RBI Act, IPR in India.	**15**
Keywords	*Cyberspace, Cybercrime, Cyber security, Physical System security, Ransomware, Modus-operandi, Authentication, Vulnerability, Intrusion Detection and Prevention, Cyber Law.*	

Signature of Convener & Members of CBoS:

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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Cyber criminology: Exploring Internet Crimes and Criminal Behavior by K. Jaishankar, CRC press.
- Data communication and Networking by B. Forouzan, TMH.
- An unofficial guide to ethical hacking by Ankit Fadia, trinity publisher.
- An ethical guide to hacking mobile phones by Ankit Fadia, trinity publisher.
- Computer Network Security and Cyber Ethics by Siva Ram Murthy,B.S. Manoj , McFarland and Company , INC

Reference Books Recommended:

- Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther 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 A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
- Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
- Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
- Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
- Fundamentals of Network Security by E. Maiwald, McGraw Hill.

Online Resources:

- Cyber Security from SWAYAM: https://onlinecourses.swayam2.ac.in/cec21_cs09/preview
- Introduction to Cyber Security from SWAYAM: https://onlinecourses.swayam2.ac.in/nou20_cs01/preview
- Cyber Security for Beginners: https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf
- Cyber Criminology by K. Jaishankar: https://larose.staff.ub.ac.id/files/2011/12/Cyber-Criminology-Exploring-Internet-Crimes-and-Criminal-Behavior.pdf
- Fundamental of Cyber Security by Dr. Jitendra Pandey: http://www.uou.ac.in/sites/default/files/slm/FCS.pdf
- Information Technology Act 2000: https://www.meity.gov.in/content/information-technology-act-2000
- Information Technology Act: https://www.meity.gov.in/content/information-technology-act
- Cyber Crime Law and Practice: https://www.icsi.edu/media/webmodules/publications/Cyber_Crime_Law_and_Practice.pdf

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment(CIA):	**30 Marks**
End Semester Exam(ESE):	**70 Marks**

Continuous Internal Assessment(CIA): **(By Course Teacher)**	Internal Test / Quiz- (2): **20 & 20** Assignment/Seminar- **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: Q1. Objective – **10** x1= **10** Mark; Q2. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts., **1 out of 2** from each unit-**4x10=40 Marks**	

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction

Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*		Semester – IV	Session: 2024-2025
1	Course Code	**CASE-02**	
2	Course Title	**Artificial Intelligence and Expert System**	
3	Course Type	**DSE (Discipline Specific Elective)**	
4	Prerequisite	*As per program*	
5	Course Learning Outcomes(CLO)	At the end of the course, students will be able to: • Understand the Basics about Artificial Intelligence and Expert Systems. • Understand the Programming Logics in Artificial Intelligence. • Understand various search methods in Artificial Intelligence. • Understand the Knowledge about the Expert Systems. • Understand the latest developments in Knowledge systems and Tools.	
6	Credit Value	**4 Credits**	***Credit = 15 Hours - Learning & Observation***
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**

PART – B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) - 60 Periods (60 Hours)

Unit	Topics (Course contents)	No .of Period
I	**Introduction:** History, Definition of AI, Emulation of human cognitive process, knowledge search trade off, stored knowledge, semantic nets. An abstract view of modelling, elementary knowledge. Computational logic, analysis of compound statements using simple logic connectives, predicate logic, knowledge organization and manipulation, knowledge acquisition.	15
II	**AI Programming languages:** LISP and other programming languages- introduction to LISP, syntax and numerical function, LISP and PROLOG distinction, input output and local variables, Interaction and recursion, property list and arrays alternative languages, formalized symbolic logics- properties of WFRS, non-deductive inference methods. Inconsistencies and uncertainties- Truth maintenance systems, default reasoning and closed world assumption, Model and temporary logic.	15
III	**Problems and Heuristic Search Techniques:** Problem Characteristics, Production Systems, Control Strategies, Search techniques: Breadth First, Depth-first search, Hill-climbing, Heuristics Search Techniques: Best First Search, A* algorithm. **Knowledge Representation:** Approaches and Issues, Frame, Conceptual dependency, Semantic Net, Scripts etc., Propositional Logic, First order, Propositional Logic (FOPL), Conversion to clausal form, Inference rules, Resolution principal.	15
IV	**Expert System:** Introduction, Application, Existing Expert systems. Components of typical expert system, Rule based system architecture. **Pattern Recognition:** Pattern recognition system- understanding speech recognition, Image transformation, low level processing, medium and high level processing, vision system architecture.	15
Keywords	*Artificial Intelligence (AI), AI Agent, State Space, Production System, LISP, PROLOG, Knowledge Representation, Semantic Net, Propositional Logic, Expert System.*	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Publication.
- Elaine Rich and Kevin Knight, Artificial Intelligence, TMH publication.
- George. F, William. A. Stubblefield, 'Artificial intelligence and the design of expert systems', The Benjamin Cummins Publishing Co., Inc 2nd Edition, 1992.
- V.S. Jankiraman, K. Sarukesi and P. Gopala krishnan, Foundations of Artificial Intelligence and Expert Systems , Macmillan Series in Computer Science.

Reference Books Recommended:

- Vinod Chandra S.S., Anand Hareendrn S., Artificial Intelligence and machine learning, PHI learning private Ltd.
- V.S. Jankiraman, K. Sarukesi and P. Gopala Krishnan, Foundations of Artificial Intelligence and Expert Systems, Macmillan Series in Computer Science
- Russel (Stuart), 'Artificial Intelligence- Modern approach, Pearson Education series in AI', 3rd Edition, 2009.
- Eugene Charniak, Drew Mc Dermot, 'Introduction to Artificial intelligence', Addison Wesley Longman Inc.,2009
- Robert J Schalkoff, 'Artificial intelligence An Engineering Approach', McGraw Hill International Edition, 1990

Online Resources:

- Introduction to Artificial Intelligence from SWAYAM: https://www.youtube.com/watch?v=pKeVMlkFpRc&list=PLwdnzlV3ogoXaceHrrFVZCJKbm_laSHcH&index=2
- Artificial Intelligence: Knowledge Representation And Reasoning from SWAYAM https://onlinecourses.nptel.ac.in/noc24_cs14/preview
- An introduction to Artificial Intelligence from SWAYAM: https://onlinecourses.nptel.ac.in/noc24_cs08/preview
- Introduction to Artificial Intelligence from Coursera: https://www.coursera.org/learn/introduction-to-ai
- Problem Solving as State Space Search from SWAYAM: https://www.youtube.com/watch?v=fLw8SfvaJWA&list=PLwdnzlV3ogoXaceHrrFVZCJKbm_laSHcH&index=3
- Heuristic Search from SWAYAM: https://www.youtube.com/watch?v=0awSpFyh2MY&list=PLwdnzlV3ogoXaceHrrFVZCJKbm_laSHcH&index=5
- Introduction to Artificial Intelligence: https://www.javatpoint.com/artificial-intelligence-ai
- How to Learn Artificial Intelligence from Coursera: https://www.coursera.org/articles/how-to-learn-artificial-intelligence
- What is knowledge representation: https://courses.csail.mit.edu/6.803/pdf/davis.pdf
- Informed Search https://www.youtube.com/watch?v=-Rf2hOyjZB8&list=PLwdnzlV3ogoXaceHrrFVZCJKbm_laSHcH&index=6
- Artificial; Intelligence and Expert System:
  - https://sist.sathyabama.ac.in/sist_coursematerial/
  - https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMRA3003.pdf

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	100 Marks
Continuous Internal Assessment (CIA):	30 Marks
End Semester Exam (ESE):	70 Marks

Continuous Internal Assessment (CIA): **(By Course Teacher)**	Internal Test / Quiz-(2): **20 & 20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: Q1. Objective – **10 x1= 10** Mark; Q2. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts., **1 out of 2** from each unit-**4x10=40 Marks**	

Name and Signature of Convener & Members of CBoS:

Dr H.S. Hota
Chairman

(Suresh Thakur)

ANJEETA KUJU

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction

Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*	Semester -V	Session: 2024-2025

1	Course Code	**CASE-03**		
2	Course Title	**Numerical Analysis**		
3	Course Type	**DSE (Discipline Specific Elective)**		
4	Prerequisite	*As per Program*		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Obtain numerical solutions of algebraic and transcendental equations. • Find out numerical solutions of system of linear equations and check the accuracy of the solutions. • Evaluating the solution of problem using various interpolating and extrapolating methods. • Solve initial and boundary value problems in differential equations using numerical methods. • Apply various numerical methods in real life problems.		
6	Credit Value	**4 Credits**	***Credit = 15 Hours - learning & Observation***	
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Numerical Methods for Solving Algebraic and Transcendental Equations:** Round-off error, Cubic and Bi-quadratic Solution: Cardon's Method, Ferrari Method, Descartes Method, Graeffe's Root Squaring, Bisection method, False position method, Fixed point iteration method, Newton's method and secant method for solving equations.	15
II	**Numerical Methods for Solving Linear Systems:** Determinant Method, Matrix Inversion Method, Lower and upper triangular (LU) decomposition of a matrix and its applications, Thomas method for tridiagonal systems; Gauss-Jordan, Jacobi's, Gauss-Seidel and successive over-relaxation (SOR) methods.	15
III	**Interpolation:** Lagrange and Newton interpolations, Piecewise linear interpolation, Cubic spline interpolation, Hermite's Interpolation, Gregory-Newton forward and backward difference interpolations. **Numerical Differentiation and Integration:** First order and higher order approximation for first derivative, Approximation for second derivative; Numerical integration: Trapezoidal rule, Simpson's rules and error analysis, Bulirsch-Stoer extrapolation methods, Richardson extrapolation.	15
IV	**Initial and Boundary Value Problems of Differential Equations:** Euler's method, Taylor's Method, Runge-Kutta methods, Predictor-Corrector, Higher order one step method, multi-step methods: Adams–Bashforth methods, Adams–Moulton methods, Finite difference method, Shooting method.	15
Keywords	*Error, Decomposition, Interpolation, Differentiation, Integration, Higher order.*	

Name and Signature of Convener & Members of CBoS:

Dr H.S. Hota
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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Brian Bradie (2006), A Friendly Introduction to Numerical Analysis. Pearson.
- C. F. Gerald & P. O. Wheatley (2008). Applied Numerical Analysis (7th edition), Pearson Education, India.
- F. B. Hildebrand (2013). Introduction to Numerical Analysis: (2nd edition). Dover Publications.

Reference Books Recommended:

- M. K. Jain, S. R. K. Iyengar & R. K. Jain (2012). Numerical Methods for Scientific and Engineering Computation (6th edition). New Age International Publishers.
- Robert J. Schilling & Sandra L. Harris (1999). Applied Numerical Methods for Engineers Using MATLAB and C. Thomson-Brooks/Cole.
- Dr B. S. Grewal, Numerical Methods, Khanna Publications.

Online Resources:

- SWAYAM/NPTEL : Online Lecture Series on Numerical Analysis
  https://onlinecourses.swayam2.ac.in/cec20_ma11/preview
  https://onlinecourses.nptel.ac.in/noc19_ma21/preview
- NPTEL : Online Lecture Series on Numerical Methods
  https://www.youtube.com/channel/UCqpVOOZS6-OFQaPKWBZLKJQ
  https://www.youtube.com/watch?v=TWAN_T66Cps&list=PLq-Gm0yRYwTguDcfylj1ZicXxzdZCAr5S

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	100 Marks
Continuous Internal Assessment (CIA):	30 Marks
End Semester Exam (ESE):	70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 & 20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – 10 x1= **10** Mark; **Q2**. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts.,**1out of 2** from each unit-**4x10=40 Marks**	

Name and Signature of Convener & Members of CBoS:

Chairman

ANJEETA KUTUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*		Semester - VI	Session: 2024-2025
1	Course Code	**CASE-04**	
2	Course Title	**Computer System Architecture**	
3	Course Type	**DSE (Discipline Specific Elective)**	
4	Prerequisite (if, any)	*As per Program*	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand the architecture and functioning of computer systems at the hardware level. • Analyze the Instruction Set Architecture (ISA) • Understand the functioning of the CPU. • Understand the concept of parallel processing with their applications. • Understand the communication between the peripheral devices and CPU. • Explore the concepts of Memory Organization.	
6	Credit Value	**4 Credits**	***Credit = 15 Hours - learning & Observation***
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**

PART -B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Fundamentals Of Basic Computer Organization And Design:** Introduction of digital components, register and its types(DR,AR,AC,IR,PC,TR,INPR,OUTR), register transfer and register transfer language, micro operations and its types, common bus system for register and memory organization, computer instruction, basic format of instruction, types of instruction according addressing field (zero, one, two, three addressing), types of instruction (MRI,NMRI), addressing modes, instruction cycle and its flowchart, types of control unit(hardwired and microprogrammed control unit), design of control unit in basic computer.	15
II	**Central Processing Unit and Parallel Processing Techniques:** Introduction to CPU, general register organization, stack organization (register stack, memory stack), application of stack organizations, CPU instructions (data transfer instruction, data manipulation instruction, program control instructions), RISC and CISC instructions, interrupts and its types, interrupt cycle. Flynn's classification of computers, Parallel processing techniques (pipeline processing, vector processing, array processing), pipeline processing concept, types of pipelines and its application, speedup ratio of a pipeline, vector processing concept and its applications, concept of array processing and its applications.	15
III	**Input – Output Organization:** Introduction to peripheral devices, input-output interface and its designing, Modes of data transfer (synchronous and asynchronous data transfer), controls in asynchronous data transfer (strobe control and handshaking control), modes of data transfer (programmed i/o, interrupt-initiated i/o and direct memory access), input-output processor.	15
IV	**Memory Organization and Multiprocessor Architecture:** Memory hierarchy, main memory and its organization (RAM and ROM Chips, memory address map, memory connections to CPU), auxiliary memory, associative memory, concept of cache memory, cache memory mapping techniques (associative mapping, direct mapping, set-associative mapping), cache coherence problem and its solution, introduction to multiprocessors, interconnection structures of multiprocessor-based systems, inter-processor communication and synchronization.	15
Keywords	*Registers, Micro operation, Instruction, Control Unit, Instruction Cycle, Interrupt Cycle, CPU, Stack,*	

	Parallel Processing, Pipeline Processing, Vector Processing, Array Processing, Asynchronous Data Transfer, DMA, RAM, ROM, Cache Memory, IOP, Multiprocessor.

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

ANJEETA KUJUR

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- M. Morris Mano, Computer System Architecture, 3e, Pearson Education
- B. Ram Sanjay Kumar, Computer Fundamentals Architecture and Organization , 5e, New Age International Publishers
- William Stalling, Computer Organization & Architecture, 11e, Pearson

Reference Books Recommended:

- Jyotsna Sengupta, Fundamentals of Computer Organization and Architecture, Deep & Deep Publications.
- Amit Kumar Mishra, A Textbook of Computer Architecture, Katson Books

Online Resources:

- NPTEL YouTube Channel: Online Lecture Series on Computer Architecture
  https://youtube.com/playlist?list=PL59E5B57A04EAE09C&si=WUP8O10Y6Zrleu-i
  https://youtube.com/playlist?list=PL1A5A6AE8AFC187B7&si=JmlOO3rT9NGSMkmN
  https://youtube.com/playlist?list=PLgHucKw979AvcnTpPNZMZyORdL5HvTr9m&si=PqOMY-sh6tCuzPXA
- NPTEL Portal : Online Lecture Computer Architecture and Organization
  NPTEL :: Computer Science and Engineering – NOC :Computer architecture and organization

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment (CIA):	**30 Marks**
End Semester Exam (ESE):	**70 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20** & **20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – 10 x1= **10** Mark; **Q2**. Short answer type- 5x4 =**20** Marks Section B: Descriptive answer type qts.,**1out of** 2 from each unit-4x10=**40** Marks	

Name and Signature of Convener & Members of CBoS:

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ANJEETA KUJUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*			Semester - VII	Session: 2024-2025
1	Course Code	**CASE-05**		
2	Course Title	**Computer Graphics**		
3	Course Type	**DSE (Discipline Specific Elective)**		
4	Pre-requisite	*As per program*		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able: • Understand the basics of computer graphics, different graphics systems and applications of computer graphics. • Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. • Use of geometric transformations on graphics objects and their application in composite form. • Extract scene with different clipping methods and its transformation to graphics display device. • Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.		
6	Credit Value	**4 Credits**	*Credit = 15 Hours - Learning & Observation*	
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–learning Periods(01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Basics of Computer Graphics**: Applications of Computer Graphics, Input Devices: Keyboard, Mouse, Trackball & Space ball, Joystick, Data Glove, Digitizers, Image Scanners, Touch panels, Light Pens systems. Output display devices: Refresh CRT, Raster-Scan display and Random-scan display technique, Color display techniques-Beam penetration method and Shadow-mask method, Direct view storage tubes, Emissive & Non-emissive flat-panel, Displays-Plasma panels, LED and LCD monitor.	15
II	**Fundamental Techniques in Graphics**: Line-drawing algorithms, DDA algorithm and Bresenham's Line drawing Algorithm, Midpoint Algorithm for Circle and Ellipse Generation, Curve generation. Attributes for output primitives: Area-filling Algorithms - Scan-line Polygon-fill.	15
III	**Geometrical Transformation**: 2D Transformation (translation, rotation, scaling, reflection and shearing), Homogeneous Coordinates and Matrix Representation of 2D Transformations, Successive and composite 2D Transformations, the Window-to-Viewport Transformations, Introduction to 3D Transformations Matrix.	15
IV	**Curves and Surfaces**: Polygon Surfaces and polygon meshes, Quadratic and super quadrics surfaces, Spline curve and representationDefinition of Bezier curve and its properties, Algorithms for Bezier curves and surfaces, Hermite curve.	15
Keywords	*Computer Graphics, Raster Scan, Random-scan, Line Drawing Algorithm, Matrix Representation*	

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
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Shajahan Ayya

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles& practice,2000.
- D.J. Gibbs & D.C. Tsichritzs: Multimedia programming Object Environment& Frame work, 2000.

Reference Books Recommended:

- Ralf Skinmeiz and Klana Naharstedt, Multimedia: computing, Communication and Applications, Pearson, 2001
- D. Haran & Baker. Computer Graphics Prentice Hall of India, 1986.

Online Resources:

- NPTEL: https://onlinecourses.nptel.ac.in/noc20_cs90
- https://mrcet.com/downloads/digital_notes/CSE/III%20Year/COMPUTER%20GRAPHICS%20NOTES.pdf
- http://www.aagasc.edu.in/cs/COMPUTER%20GRAPHICS%20NOTES.pdf
- https://archive.mu.ac.in/myweb_test/S.Y.B.Sc.(IT)%20(Sem%20%20III%20)%20Computer%20Graphics.pdf

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4x10=40 Marks**	

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

ANJEETA KUJUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF COMPUTER APPLICATION

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*			Semester - VII	Session: 2024-2025
1	Course Code	**CASE-06T**		
2	Course Title	**Cloud Computing**		
3	Course Type	**DSE (Discipline Specific Elective)**		
4	Pre-requisite	*As per program*		
5	Course Learning Outcomes (CLO)	After Completing this course, students will be able to: • Understand the concepts, characteristics and benefits of cloud computing. • Understand the key security and compliance challenges of cloud computing. • Understand the concept of Cloud Security and governance. • Learn the Concept of Cloud Infrastructure Model. • Understand the cloud storage, Cloud Virtualization & Micro services.		
6	Credit Value	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Fundamental Cloud Computing:** Concepts, Terminology, Technologies, Benefits, Challenges, SLAs and business cost metrics associated with cloud computing, SaaS, IaaS, PaaS delivery models, Common cloud deployment models and cloud characteristics, Various applications of cloud computing. **Cloud Architecture:** The technology architecture of cloud platforms and cloud-based solutions and services and their utilization via a set of cloud computing design patterns, Hybrid cloud deployment models, Compound design patterns and solution architectures that span cloud and on-premise environments.	12
II	**Cloud Security & Governance:** The cloud security mechanisms, cloud security architecture, A set of security design patterns, The definition of cloud governance precepts, Roles, Practices and processes, Common governance challenges and pitfalls specific to cloud computing.	11
III	**Cloud Storage:** The cloud storage devices, Structures and technologies, cloud storage mechanisms, Persistent storage, Redundant storage, Cloud-attached storage, Cloud-remote storage, Cloud storage gateways, Cloud storage brokers, Direct Attached Storage (DAS), Network Attached Storage (NAS), Storage Area Network (SAN), Various cloud storage-related design patterns.	11
IV	**Cloud Virtualization & Microservices:** Core topic areas pertaining to the fundamental virtualization mechanisms and types used within contemporary cloud computing platforms are explored along with various key performance indicators and related metrics, Microservices of Cloud Computing.	11

Keywords *Cloud Computing, Security, Governance, Storage, Virtualization.*

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Distributed Computing by Dollymore Cloud Computing (Wind) by Dr. Kumar Saurabh, 2nd Edison, Wiley India.

Reference Books ***Recommended:***

- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011 Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012.
- Handbook of Cloud Computing by Anand Nayyar, Publisher: BPB Publication.

Online Resources:

- Introduction to Cloud Computing from W3shool: https://www.w3schools.in/cloud-computing/tutorials/
- Introduction to Cloud Computing from Coursera: https://www.coursera.org/learn/introduction-to-cloud
- Cloud Computing Basics: https://www.coursera.org/learn/cloud-computing-basics
- Cloud Computing Concepts: https://www.coursera.org/learn/cloud-computing
- Cloud Computing Specialization from Coursera: https://www.coursera.org/specializations/cloud-computing
- Cloud Computing from SWAYAM/NPTEL: https://onlinecourses.nptel.ac.in/noc22_cs20/preview https://www.youtube.com/channel/UCK73enkjfQNDwdBqMyaMtRg
- Cloud Computing Basics: https://terrorgum.com/tfox/books/cloudcomputingbasics_aselfteachingintroduction.pdf
- CLOUD COMPUTING Principles and Paradigms : https://dhoto.lecturer.pens.ac.id/lecture_notes/internet_of_things/CLOUD%20COMPUTING%20Principles%20and%20Paradigms.pdf
- Cloud Computing Tutorial For Beginners: https://www.youtube.com/watch?v=fLV_t2qKYyU
- Introduction to Cloud Computing: https://www.youtube.com/watch?v=Dv0sjAYnVCY
- Cloud Computing Tutorials: https://www.youtube.com/watch?v=NyA9PB6j8bg

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment (CIA):	**30 Marks**
End Semester Exam (ESE):	**70 Marks**

Continuous Internal Assessment (CIA): **(By Course Teacher)**	Internal Test / Quiz-(2): **20** +**20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10** x1= **10** Mark; **Q2**. Short answer type- **5**x4 =**20** Marks Section B: Descriptive answer type qts.,**1 out of 2** from each unit-4x10=**40 Marks**	

Name and Signature of Convener & Members of CBoS:

Dr H.S. Hota
Chairman

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction

Program: Bachelor of Computer Application *(Certificate / Diploma / Degree)*	Semester - VII	Session: 2024-2025

1	Course Code	**CASE-06P**	
2	Course Title	**Lab 14: Cloud Computing**	
3	Course Type	**Practical**	
4	Prerequisite	***As per program***	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Identify the appropriate cloud services for a given application. • Assess the comparative advantages and disadvantages of Virtualization technology. • Analyze authentication, confidentiality and privacy issues in cloud computing. • Identify security implications in cloud computing. • Understand the importance of protocols and standards in management for cloud services.	
6	Credit Value	**1 Credits**	***Credit =30 Hours Laboratory or Field Learning/Training***
7	Total Marks	**Max. Marks: 50**	**Min Passing Marks: 20**

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
List of Practical Experiment	**Note:** This is tentative list; the teachers concern can add more experiments as per requirement. 1. Use gcc to compile c-programs. Split the programs to different modules and create an application using make command. 2. Use version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories. 3. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8. 4. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs 5. Install Google App Engine. Create hello world app and other simple web applications using python/java. 6. Use GAE launcher to launch the web applications. 7. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim. 8. Find a procedure to transfer the files from one virtual machine to another virtual machine. 9. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version) 10. Install Hadoop single node cluster and run simple applications like word count.	**30**
Keywords	*Cloud Computing, Security, Governance, Storage, Virtualization.*	

Name and Signature of Convener & Members of CBoS:

Dr. H S Hota
Chairman

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, McGraw Hill Education.
- Barrie Sosinsky, "Cloud Computing Bible", Wiley India Edition.
- Anthony Velte, toby Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach", Tata McGraw-Hill Edition.
- Kailash Jayaswal et al., Kogent Learning Solutions, Cloud Computing: Black Book, Dreamtech Press.

Reference Books Recommended:

- Rajkumar Buyya et al., Cloud Computing: Principals and Paradigms, Wiley India.
- Cloud Computing: Concepts, Technology & Architecture, Erl, Pearson Education India.
- Barrie Sosinsky, Cloud Computing Bible, O'Reilly Media.
- Toby Velte, Anthony Vote and Robert Elsenpeter, Cloud Computing: A Practical Approach, McGraw Hill.
- George Reese, Cloud Application Architectures: Building Applications and Infrastructures in the Cloud, O'Reilly Media.

Online Resources:

- Swayam/NPTEL: https://www.youtube.com/channel/UC6ZY_csXZc7YZZm2W8HcQ6A
- Javatpoint: https://www.javatpoint.com/iot-internet-of-things
- Tutorialspoint: https://www.tutorialspoint.com/internet_of_things/index.htm
- Topics Related to IOT from data-flair: https://data-flair.training/blogs/iot-tutorial/
- Topics Related to IOT from edureka: https://www.edureka.co/blog/iot-tutorial/
- Coursera: https://www.coursera.org/courses?query=computing
- Introduction to Cloud Computing from W3shool: https://www.w3schools.in/cloud-computing/tutorials/
- Introduction to Cloud Computing from Coursera: https://www.coursera.org/learn/introduction-to-cloud
- Cloud Computing Basics: https://www.coursera.org/learn/cloud-computing-basics
- Cloud Computing Concepts: https://www.coursera.org/learn/cloud-computing
- Cloud Computing Specialization from Coursera: https://www.coursera.org/specializations/cloud-computing
- Cloud Computing from SWAYAM/NPTEL https://onlinecourses.nptel.ac.in/noc22_cs20/preview https://www.youtube.com/channel/UCK73enkjfQNDwdBqMyaMtRg
- Lab Manuals:
- https://annauniversityedu.blogspot.com/2020/10/cs8711-cloud-computing-laboratory.html
- https://drive.google.com/file/d/1oiuQYwkgFXy4R45l8us4ynnXNFqx6OkW/view
- https://www.vidyarthiplus.com/vp/attachment.php?aid=53342
- https://www.iare.ac.in/sites/default/files/lab1/CAD%20LAB%20UPDATED%20BY%20ANJAIAH-%20FINAL_0.pdf
- https://jainakshay781.files.wordpress.com/2019/02/final-cc-lp-iv-manual-1.pdf
- http://www.gpcet.ac.in/wp-content/uploads/2018/08/GCC-LAB-MANUAL.pdf

- https://shanpnk.weebly.com/uploads/5/8/9/4/58948709/gcclab-courseware-labmanual.pdf
- https://www.bharathuniv.ac.in/downloads/csc/BCS7L1%20-Grid%20&%20Cloud%20Computing%20lab.pdf

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks
End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

ANJEETA KUJUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF COMPUTER APPLICATION

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*			Semester - VII	Session: 2024-2025
1	Course Code	**CASE-07**		
2	Course Title	Cryptography and Network Security		
3	Course Type	**DSE (Discipline Specific Elective)**		
4	Pre-requisite	***As per program***		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Classify the symmetric encryption techniques. • Illustrate various Public key cryptographic techniques. • Evaluate the authentication and hash algorithms. • Summarize the intrusion detection and its solutions to overcome the attacks. • Basic concepts of system level security.		
6	Credit Value	**4 Credits**	***Credit = 15 Hours - Learning & Observation***	
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Classical Encryption Technique:** Basics of computer network, TCP/IP model, Foundations of Cryptography and security trends, Secret key vs public key cryptography, Symmetric cipher model, substitution techniques, Transportation techniques, Mathematical tools for cryptography: modular arithmetic, Euclidean algorithm, finite fields, polynomial arithmetic. **Symmetric cipher:** Symmetric cipher model, Traditional block cipher: Stream and block cipher, Feistel cipher network structure, Design Principles of Block Ciphers, Data Encryption Standard (DES), Strength of DES Triple DES, Block cipher design principal, Block cipher operation, Advance encryption Standard (AES), Evaluation criteria of AES,AES transformation function, key distribution.	15
II	**Public Key cryptography and Hash Function:** Principles of public key cryptosystem, requirement, RSA algorithm. Hash function, Key management: Diffie-Helman Key exchange, Man in the middle attack, elliptic curve arithmetic, elliptic curve cryptography, Application of cryptographic hash function, Hash and Message authentication Code (MAC), Hash and MAC algorithms, MAC based on hash function, Digital signature and Authentication protocol. Key management and distribution: Distribution of symmetric key and public key, Public key Infrastructure (PKI).	15
III	**IP and Web security protocols:** User authentication: principle, Remote user authentication using symmetric and asymmetric encryption, Kerberos, E-mail security: Pretty Good Privacy (PGP), S/MIME, IP security: IPsec, transport layer Security: Secure Socket layer (SSL), Secure Electronic Transaction (SET).	15
IV	**Network Security and Management:** Principles of cryptography, Authentication, integrity, key distribution and certification, Access control and Firewalls, attacks and counter measures, security in many layers. Infrastructure for network management, The internet standard management framework, SMI, MIB, SNMP, Security and administration.	15
Keywords	*Symmetric Cipher, Hash, Message Authentication Code (MAC), Public key, Private key, Secure Socket Layer (SSL), Secure Electronic Transaction (SET).*	

Name and Signature of Convener & Members of CBoS:

Dr H.S Hota
Chairman

ANJEETA KUJUR

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Cryptography and Network Security, William Stallings, 4th Edition Pearson Publication.
- Network security and cryptography, Bernard Menezes, Cenage Learning India Pvt. Ltd. First edition 2010.

Reference Books ***Recommended:***

- Applied cryptography - protocols and algorithm, Buce Schneier, Springer Verlag 2003.
- Cryptography and Network Security, Atul Kahate , TMH Publication.
- Cryptography and Network Security, Behrouz A. Forouzan, First Edition, TMH Publication.
- Network Security: Private Communication in Public World By Charlie Kaufman ,Radia Perlman and Mike Speciner, PHI Publication.

Online Resources:

- Swayam/NPTEL: https://onlinecourses.nptel.ac.in/noc20_cs21/preview
- Swayam/NPTEL: https://onlinecourses.nptel.ac.in/noc20_cs02/preview
- Coursera: https://www.coursera.org/search?query=Cryptography
- Coursera: https://www.coursera.org/search?query=network%20sequrity&
- https://www.gatevidyalay.com/tag/cryptography-and-network-security-tutorial/
- https://www.javatpoint.com/computer-network-security
- https://www.geeksforgeeks.org/cryptography-introduction/
- https://www.tutorialspoint.com/cryptography/index.htm
- https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
- Lab Manuals:
  - http://www.anuraghyd.ac.in/cse/wp-content/uploads/sites/10/NS-CRYPTO-LAB-Final11.pdf
  - https://www.vvitengineering.com/lab/odd/CS6711-Security-Lab-Manual.pdf
  - https://www.vidyarthiplus.com/vp/attachment.php?aid=53300
  - https://kgr.ac.in/storage/2021/08/CNS-LAB-Manual.pdf

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	100 Marks
Continuous Internal Assessment (CIA):	30 Marks
End Semester Exam (ESE):	70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts.,1 out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

ANJEETA KUJUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*			Semester – VII	Session: 2024-2025
1	Course Code	**CASE-08**		
2	Course Title	**Advanced Operating Systems**		
3	Course Type	**DSE (Discipline Specific Elective)**		
4	Prerequisite	*As per program*		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Knowledge about advanced concepts in OS. • Ability to develop OS for distributed systems. • Understand process synchronisation and concurrency control. • Understand the architecture and functioning of mobile operating system. • Ability to develop modules for mobile devices.		
6	Credit Value	**4 Credits**	***Credit = 15 Hours - Learning & Observation***	
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Multiprocessor Operating Systems:** System Architectures, Structures of OS, OS design issues, Process synchronization, Process Scheduling and Allocation, memory management.	15
II	**Distributed Operating Systems:** System Architectures, Design issues, Communication models, clock synchronization, mutual exclusion, election algorithms, Distributed Deadlock detection, Distributed scheduling, Distributed shared memory, Distributed File system, Multimedia file systems, File placement, Caching.	15
III	**Database Operating Systems:** Requirements of Database OS, Transaction process model, Synchronization primitives, Concurrency control algorithms.	15
IV	**Mobile Operating Systems:** ARM and Intel architectures, Power Management, Mobile OS Architectures, Underlying OS, Kernel structure and native level programming, Runtime issues, Approaches to power management.	15
Keywords	*Multiprocessor operating system, Distributed operating system, Database operating System, Mobile Operating system.*	

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

(Sourabh Thakur)

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Mukesh Singhal, Niranjan Shivaratri, "Advanced Concepts in Operating Systems", TMH,2001
- William Stallings, "Operating Systems – Operating System: Internals and Design Principles", Prentice Hall, 2005.

Reference Books Recommended:

- Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education, 1995.
- Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", John Wiley & Sons Inc., 2006.

Online Resources:

- Advanced Concepts in Operating Systems: https://books.google.co.in/books/about/Advanced_Concepts_in_Operating_Systems.html?id=ajx9NAEACAAJ&redir_esc=y
- Distributed Operating System: *https://www.javatpoint.com/distributed-operating-system*
- Mobile Operating System
  - https://www.sciencedirect.com/topics/computer-science/mobile-operating-system
  - https://baou.edu.in/assets/pdf/PGDMAD_101_slm.pdf
- Database operating System:
  - https://www.redswitches.com/blog/database-operating-system/#:~:text=A%20Database%20Operating%20System%20(DBOS,storage%2C%20retrieval%2C%20and%20manipulation.
  - https://www.ibm.com/docs/en/psfa/7.2.1?topic=logs-database-operating-system
  - https://eecs.berkeley.edu/230426-2/

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts.,1 out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

Dr. H.S Hota Chairman

(Suresh Thakur)

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE CURRICULUM

PART- A: Introduction

Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*	Semester – VIII	Session: 2024-2025

1	Course Code	**CASE-09**		
2	Course Title	**Soft Computing**		
3	Course Type	**DSE (Discipline Specific Elective)**		
4	Prerequisite	*As per program*		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Analyze and appreciate the applications which can use fuzzy logic. • Understand the difference between learning and programming and explore practical applications of Neural Networks (NN). • Students would understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications • Ability to appreciate the importance of optimizations and its use in computer engineering fields and other domains. • To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.		
6	Credit Value	**4 Credits**	*Credit = 15 Hours - Learning & Observation*	
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Introduction:** Soft computing, Different tools of soft computing: Fuzzy logic, Artificial Neural Network, Genetic Algorithm), Area of application. **Fuzzy Logic:** Introduction to Classical Sets and Fuzzy Sets, Membership Function, properties and operations of classical set and Fuzzy set, a-cuts, Properties of a-cuts, Linguistic Variables, Membership function, Classical relation and Fuzzy Relation and its properties and operations, Defuzzification and its methods, Fuzzy rule base.	15
II	**Artificial Neural Network(ANN):** Architecture, Introduction, Evolution of Neural Network, Biological Neural Network Vs ANN, Basic Model of ANN, Different types of ANN, Single layer Perceptron, Solving XOR problem, Activation function, Linear severability, Supervised and unsupervised learning, perceptron learning, delta learning, Feed-forward and Feedback networks, Error Back Propagation Network (EBPN), Associative memories and its types, Hopefield Network, Kohenenself-organizing Map.	15
III	**Genetic Algorithm:** What is Optimization?, Introduction, Application, GA operators: selection, crossover and mutation, different techniques of selection, crossover and mutation, different types of chromosomes, Application of GA.	15
IV	**Hybrid soft commuting:** Design of Neuro-Fuzzy model like ANFIS, Neuro-Genetic, Fuzzy-Genetic Neuro-Fuzzy-Genetic model.	15
Keywords	*Soft Computing, Fuzzy Logic, ANN, Genetic Algorithm.*	

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

Suresh Thakur

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Principles of soft computing, S.N. Shivanandan and S.N. Deepa , Wiley publication, Wiley India Edition.
- Neural network and Learning Machines, Simon Haykin, Pearson Education, 2011.
- Artificial Neural Networks, Robert J. Scholkoff, McGraw Hill Education (India) Pvt. Limited, 1997.
- Fuzzy Sets, Uncertainty and Information, G. J. Klir and T.A. Folger, PHI learning private limited. Publisher– Pearson 3Edition 1999

Reference Books Recommended:

- Neural Networks and Fuzzy Systems, A dynamical Systems Approach to Machine Learning, Bart Kosko, PHI learning private limited.
- Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S. Rakasekaran, G.A. VijayalakshmiPai, PHI learning private limited, 14th Edition. 2003.
- Neural Networks and Fuzzy Logic, K. Vinoth Kumar, R. Saravana Kumar, S. K. Kataraia and Sons publication.
- Artificial Neural Networks, B.Yegnanarayana Prentice Halll of India (P) Limited.
- Introduction to Artificial Neural Systems, Jacek M. Zurada, Jaico Publication House.

Online Resources:

- Introduction to Soft Computing from SWAYAM-NPTEL: https://www.classcentral.com/course/swayam-introduction-to-soft-computing-10053
- Introduction to Soft computing: What is soft computing - Javatpoint
- Need for Soft Computing: Need for Soft Computing - GeeksforGeeks
- Introduction To Soft Computing: Introduction To Soft Computing - Course (nptel.ac.in)

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: **100 Marks**

Continuous Internal Assessment (CIA): **30 Marks**

End Semester Exam (ESE): **70 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 & 20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – 10 x1= **10** Mark; **Q2**. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4x10=40 Marks**	

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

ANJEETA KUJUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF COMPUTER APPLICATION

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*			Semester – VIII	Session: 2024-2025
1	Course Code	**CASE-10**		
2	Course Title	**Digital Image Processing**		
3	Course Type	**DSE (Discipline Specific Elective)**		
4	**Prerequisite** (if, any)	***As per program***		
5	**Course Learning Outcomes (CLO)**	At the end of this course, the students will be able to: • Learn and understand the digital image processing. • Learn and understand various image transform used in digital image processing. • Learn and understand various image enhancement techniques used in digital image processing. • Learn and understand various image restoration techniques and methods used in digital image processing. • Learn and understand various image compression and Segmentation used in digital image processing.		
6	Credit Value	**4 Credits**	***Credit = 15 Hours - Learning & Observation***	
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Introduction -** Digital image processing, Elements of Digital Image Processing system, Visual perception and properties of human eye, Image representation, A simple image model, Some basic relationship between pixels, Image geometry.	15
II	**Fourier and Image Transform** - Introduction to Fourier Transform, DFT & FFT, Properties of 2D Fourier Transform, Separable Image Transforms –Walsh, Hadamard Transform, Discrete Cosine Transform, Haar Transform	15
III	**Image Enhancement and Filtering** - Image Enhancement - Histogram Modeling, Equalization and modification, Image smoothing, Image sharpening, Spatial Filtering, Homomorphic filtering for image enhancement, Model of Image Degradation/Restoration process, Inverse filtering, Least Mean Square (Wiener) filtering, Constrained least mean square restoration, Singular value decomposition, Recursive filtering.	15
IV	**Image Compression and Segmentation** - Image compression models, Lossless compression: Variable length coding, LZW coding, Lossy Compression: Transform coding, Wavelet coding, Image Segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding-Region oriented segmentation and Texture.	15
Keywords	*Digital Image, Image Transform, Image Enhancement, Image compression.*	
Name and Signature of Convener & Members of CBoS:		

Dr H.S. Hota
Chairman

(Suresh Thakur)

ANJEETA KUJUR

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Rafael C Gonzalez, Richard E Woods, "Digital Image Processing" - 2nd Edition, Pearson Education 2003
- Jain A.K., "Fundamentals of Digital Image Processing", Pearson education.

Reference Books Recommended:

- William K Pratt, "Digital Image Processing", John Willey 2001
- Millman Sonka, Vaclav Hlavac, Roger Boyle, Broos/Colic, "Image Processing Analysis and Machine Vision" - Thompson Learning, 1999.
- Chanda S., Dutta Majumdar - "Digital Image Processing and Applications", Prentice Hall of India, 2000.

Online Resources:

- Digital Image Processing Basics: https://www.geeksforgeeks.org/digital-image-processing-basics/
- Digital Image Processing: https://www.javatpoint.com/digital-image-processing-tutorial
- Digital Image Processing: https://www.tutorialspoint.com/dip/index.htm
- Digital Image Processing: https://in.mathworks.com/discovery/digital-image-processing.html
- NPTEL:
  - https://onlinecourses.nptel.ac.in/noc19_ee55/preview.
  - https://nptel.ac.in/courses/117105135
- Coursera : https://www.coursera.org/courses?query=image%20processing

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment (CIA):	**30 Marks**
End Semester Exam (ESE):	**70 Marks**

Continuous Internal Assessment (CIA): **(By Course Teacher)**	Internal Test / Quiz-(2): **20** +**20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4x10=40 Marks**	

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

(Suresh Thakur)

ANJEETA KUJUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*			Semester – VIII	Session: 2024-2025
1	Course Code	CASE-11		
2	Course Title	**Big Data Analytics**		
3	Course Type	**DSE (Discipline Specific Elective)**		
4	Prerequisite	*As per program*		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand fundamentals of Big Data analytics. • Investigate Hadoop framework and Hadoop Distributed File system. • Demonstrate the Map Reduce programming model to process the big data along with Hadoop tools. • Analyze web contents and Social Networks to provide analytics with relevant visualization tools. • Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.		
6	Credit Value	**4 Credits**	*Credit = 15 Hours - Learning & Observation*	
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Understanding Big Data:** Datasets, Data Analysis, Data Analytics-Descriptive Analysis, Diagnostics Analytics, Predictive Analytics, Prescriptive Analytics, Big Data Characteristics – volume, velocity, variety, veracity, value, Different Types of Data – Structured Data, Unstructured Data, Semi-Structured Data.	15
II	**Introduction Hadoop:** Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.	15
III	**Hadoop Architecture:** Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks.	15
IV	**Theory and Methods for Big Data Analytics:** Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference and Bayesian Networks, Support Vector and Kernel Methods, Analysis of Time Series: Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Decision Trees.	15
Keywords	*Big Data, Hadoop, Mapreduce, YARN, Spark, Hive, Hbase, Pig, Sqoop, Oozie.*	

Name and Signature of Convener & Members of CBoS:

Dr H.S. Hota
Chairman
Sushil
ANJEETA KUJUR

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Chris Eaton, Dirk deroos et al. , —Understanding Big data , McGraw Hill, 2012.
- Thomas Erl, Wajid Khattak, Paul Buhler,Big Data Fundamentals: Concepts, Drivers & Techniques, 1/e, 2016, Prentice Hall.
- Vignesh Prajapati, Big Data Analytics with R and Hadoop, 1e, 2013, Packt Publishing Ltd, UK.

Reference Books Recommended:

- Norman Matloff, The Art of R Programming: A Tour of Statistical Software Design, revised, 2011, No Starch Press
- Tom White, "Hadoop:The Definitive Guide," 3/e, 2012, O'REILLY Publications.
- Paul Zikopoulos, IBM, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data", 2012, The McGraw-Hill Companies.
- Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", 2014, Wiley Publications.
- Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets‖, 2012, Cambridge University Press.

Online Resources:

- Swayam/NPTEL: https://onlinecourses.nptel.ac.in/noc20_cs92/preview
- Swayam/NPTEL: https://onlinecourses.swayam2.ac.in/arp19_ap60/preview
- Coursera: https://www.coursera.org/search?query=big%20data%20analytics
- What is Big Data?: https://www.javatpoint.com/what-is-big-data
- Big Data Tutorials:
- https://www.edureka.co/blog/big-data-tutorial
- https://www.guru99.com/bigdata-tutorials.html
- https://www.softwaretestinghelp.com/big-data-tutorial/
- https://data-flair.training/blogs/big-data-tutorials-home/
- https://www.simplilearn.com/tutorials/big-data-tutorial
- https://www.tutorialspoint.com/big_data_tutorials.htm
- Big Data Practical Approach:
- http://deccancollege.ac.in/MCALABMANUALS/BIGDATALABMANUAL.pdf
- https://www.iare.ac.in/sites/default/files/lab1/IARE_BIGDATA_LAB_MANUAL.pdf
- https://www.studocu.com/in/document/gujarat-technological-university/big-data-analytics/big-data-analytics-2180710-lab-manual/18844373
- https://usermanual.wiki/Document/CP5261202020DATA20ANALYTICS20LABORATORY20MANUAL20ME20CSE.1885205982/help
- https://sites.google.com/site/vsat2k/beit_bda

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment (CIA):	**30 Marks**
End Semester Exam (ESE):	**70 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 & 20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks

End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – 10 x1= **10** Mark; **Q2**. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4x10=40 Marks**

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

(Suresh Thakur)

ANJEETA KUJUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART- A: Introduction

Program: Bachelor in Computer Application *(Certificate / Diploma / Degree/Honors)*		Semester - VIII	Session: 2024-2025
1	Course Code	**CASE-12**	
2	Course Title	**Major Project-2**	
3	Course Type	**DSE (Discipline Specific Elective)**	
4	Prerequisite	*As per program*	
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Enhance knowledge on latest techniques. • Make ready for IT industry. • Upgrade skill set as per IT industry. • Handle real word applications. • Debug Problem to make DFD of proposed system.	
6	Credit Value	**4 Credits**	*Credit = 15 Hours - Learning & Observation*
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**

PART -B: Content of the Course

Total No. of Teaching–Learning hours - 60 Hours

	Important Guidelines for Project	No. of Period
	A project report has to be submitted as per the rules described below: 1. **Number of Copies:** The student should submit One hard bound copy of the Project Report with one CD/DVD. 2. **No of students:** Every student has to submit separate project. 3. **Acceptance / Rejection of Project Report:** The student must submit a project report to the Head of Department/Project Guide for approval. The Head of Department/Project Guide holds the right to accept the project or suggest modifications for resubmission. 4. **Format of the Project Report :**The student must adhere strictly to the following format for the submission of the Project Report I. **Paper:** The report shall be typed on white paper, A4 size or continuous computer stationary bond, for the final submission. The report to be submitted to the University must be original and subsequent copies may be photocopied on any paper. II. **Typing:** The typing shall be of standard letter size, double-spaced and on one side of the paper only, using black ribbons and black carbons. III. **Margins:** The typing must be done in the following margins Left ----- 35mm, Right ----- 20mm Top ----- 35mm, Bottom ----- 20mm IV. **Binding:** The Report shall be Rexene bound in black. Plastic, spiral bound Project Reports not be accepted. V. **Front Cover:** The front cover should contain the following details: **TOP:** The title in block capitals of 6mm to 15mm letters. **CENTER:** Full name in block capitals of 6mm to 10mm letters. **BOTTOM:** Name of the University, year of submission- all in block capitals of 6mm to 10mm letters on separate lines with proper spacing and centring.	60

VI. **Blank Sheets:** At the beginning and end of the report, two white black bound papers should be provided, one for the purpose of binding and other to be left blank.

5. **Abstract:** Every report should have an abstract following the Institute's Certificate. The abstract shall guide the reader by highlighting the important material contained in the individual chapters, section, subsection etc.
6. **Certificates etc:** The report should contain the following:
   I. Institute Certificate: Successful completion of project by competent authority.
   II. Acknowledgment
   III. List of Figures
   IV. Tables
   V. Nomenclature and Abbreviations
7. **Contents of the Project Report:** The project report must contain following in form of chapter, however student may include any other relevant chapter(s):
   I. **Introduction to the project:** This chapter shall highlight the purpose of project work, it will also define the chapters to be followed in the Project Report.
   II. **Scope of work:** Brief scope of the project work done
   III. **Existing System and Need for proposed System:** If there is some system already in use, then give brief detail of it in order to help to understand the enhancements carried out by the student in the existing system.
   IV. **Operating Environment**: Hardware and Software required and used.
   V. **Proposed System:** Which may contain following:
      a. **Objectives to be fulfilled**: clearly define the objective(s) of the system.
      b. **User Requirements**: State the requirements of the use in an unambiguous manner.
      c. **Requirements Determination Techniques and Systems Analysis Methods Employed:** Use the formal methods to describe the requirements of the use like Fact Finding Methods, Decision Analysis, and Data Flow Analysis etc.
      d. **Prototyping:** If the prototypes has been developed prior to the detailed design, then give details of the prototype.
      e. **System Feature**: Which includes as follows:
      - Module specifications
        - D.F.D. and ER
        - System flow charts
        - Data Dictionary
        - Structure charts
        - Database /File layouts
        - Design of Input Design of Output screens and reports
        - User Interfaces
        - Design of Control Procedures
8. **Testing procedures and Implementation phase**
9. **Problems encountered, Drawbacks and Limitations**
10. **Proposed Enhancements/ Future enhancement**
11. **Conclusions**
12. **Bibliography**
13. **Annexure**

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

ANJEETA KUJUR

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Database system concept, H. Korth and A. Silberschatz, TMH Publications.
- Data Base Management System, Alexies & Mathews,Vikash publication.
- Roger S. Pressman, Software Engineering, A practitioner's Approach, 6th edition, McGraw Hill International Edition.

Reference Books Recommended:

- The Complete Reference, Kevin Loney, Oracle Press.
- SQL, PL/SQL the Programming Language of Oracle, Ivan Bayross, PustakKosh Publication.
- Microsoft SQL Server Management and Administration, Ross, STM Publications.
- James Rumbaugh, Ivar Jacobson, The unified modelling language user guide Grady Booch, Pearson Education.

Online Resources:

- SWAYAM URL link for DBMS and RDBMS: https://youtu.be/f6LGtJutWyA
- SWAYAM URL link for DBMS and RDBMS: https://**swayam**.gov.in/courses/4434-data-base-management-system
- Introduction of RDBMS from SWAYAM : https://onlinecourses.nptel.ac.in/noc19_cs46/preview
- Introduction to DMBS: https://www.w3schools.in/dbms/intro
- NPTEL YouTube Channel: Software Engineering Lectures by Prof Rajib Mall, IIT Kharagpur https://youtube.com/playlist?list=PLbRMhDVUMngf8oZR3DpKMvYhZKga90JVt&si=tTBITZUdivHpNz1H
- NPTEL YouTube Channel: Software Engineering Lecture Series https://youtube.com/playlist?list=PL8751DA481F0F0D17&si=07IfYV7GP8_oc1xZ

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	100 Marks
End Semester Exam (ESE):	100 Marks

Name and Signature of Convener & Members of CBoS: