



Thakur Educational Trust's (Regd.)

**THAKUR RAMNARAYAN
COLLEGE OF ARTS & COMMERCE**

NAAC Accredited & ISO 21001:2018 Certified



Thakur Ramnarayan Educational Campus, S.V. Road, Dahisar (East), Mumbai - 400 068

Tel: 022 2828 1200 | Fax: 022 2828 1300 | www.trcac.org.in

Outcome Based Education (OBE) Document

Programme: B.Sc. (C.S.)

Program Educational Objectives

PEO 1: To prepare students for a career in Computer Science and its applications such as the design, development, implementation, testing and maintenance of computer software/hardware in a professional career.

PEO 2: To develop the skill sets of students to be at par with the advancements in the Computer Science domain.

PEO 3: To prepare the student for entry into a program of postgraduate study in Computer Science and related domains/ fields.

Program Outcomes

On successful completion, graduates of B.Sc. (C.S.) programme will be able to:

PO 1: Disciplinary Knowledge: Apply the knowledge of mathematics, computer science and Information Technology fundamentals to find solutions of real time problems with different applications.

PO 2: Effective Communication Skills: Communicate effectively on complex activities with the end users and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 3: Critical thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, testing out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO 4: Problem Solving: Identify, formulate, research literature, and analyse various research and real time application scenarios reaching substantiated conclusions using first principles of mathematics, computer sciences, and information technology.

PO 5: Analytical Reasoning: Develop ability to analyse a problem, identify and define applications that resolves the end user requirement with respect to real time problems with appropriate consideration for the societal, and environmental considerations.

PO 6: Research Related Skills: Use research-based knowledge and research methods to investigate the problems that cannot be solved by straightforward application of knowledge, theories and techniques; that may not have a unique solution, which need to be defined (modelled) within appropriate mathematical framework/ scientific derivation/ global technological evolutions.

PO 7: Environment and Sustainability: Understand the impact of the scientific applications and solutions in societal and environmental contexts, and demonstrate the knowledge of green computing and need for sustainable development.

PO 8: Cooperation/ Teamwork: Function effectively as an individual, and as a member or team leader in diverse cross functional groups and in multidisciplinary settings.

PO 9: Information/Digital Literacy: Create, select, and apply appropriate techniques, resources, and modern tools including prediction and modelling to complex activities with an understanding of the limitations.

PO 10: Ethics: Apply ethical principles and commit to professional ethics & responsibilities and norms of technological and sustainable development.

PO 11: Self-directed and Life-long Learning: Recognize the need for and have the preparation and ability to engage independent and lifelong learning in the broadest context of global technological evolution.

PO 12: Leadership Readiness/Qualities: Demonstrate knowledge and understanding of the Computer Science, Information Technology and Management principles and apply these to one's own work, as a member and leader in a team, to manage research and application projects and in multidisciplinary environments.

Program Specific Outcomes

On successful completion, graduates of B.Sc. (C.S.) programme will be able to:

PSO 1: Demonstrate technical knowledge and illustrate the required skills for software development with the help of basic hardware components. Apply standard software engineering practices and strategies in the development using open-source programming environment.

PSO 2: Develop the skills of logical thinking, analytical thinking & acquire essential skills of both verbal as well as non-verbal communication.

PSO 3: Apply concepts of wired, wireless, embedded and IoT systems for demonstrating innovative solutions with consideration to real-time applications. Develop knowledge of basic concepts of computer network, security and software testing.

PSO 4: Acquaint with contemporary issues, latest trends in technological evolution and thereby develop new ideas and design new solutions to existing problems.

T.Y.B.Sc. (C.S.) (Semester - V)**Major - Artificial Intelligence****Course Incharge: Mr.Prasoon Pandey****Course Outcomes**

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	A	E	C
CO1	Explain the principles of intelligent agents, search strategies, and logical Explain reasoning frameworks. (Artificial Intelligence, History and State of the Art of AI, Intelligent Agents, Knowledge representation, Reasoning and Machine Learning, Probabilistic Models, Unsupervised Learning and Reinforcement Learning.)		✓				
CO2	Apply informed and uninformed search algorithms and adversarial reasoning Apply techniques to solve AI problems. (Breadth First Search & Depth First Search Algorithm, A* Search, Decision Tree Learning, Feed Forward Backpropagation Neural Network, Support Vector Machines, Naive Bayes' Classifier, K-NN.)			✓			
CO3	Implement and evaluate basic machine learning models for classification, Analyse regression, and clustering tasks. (implement these algorithms and mechanisms using Reasoning, Planning, Fuzzy Logic, Decision Trees, SVM, ANN.)				✓		
CO4	Analyze probabilistic models including Bayesian networks and hidden variable models for uncertain scenarios. (Evaluate the Algorithms and mechanisms, Knowledge representation, Machine learning, Statistical learning, Naive Bayes Classifier.)					✓	
CO5	Assess AI systems from a responsible AI perspective, identifying bias, fairness, transparency, and generative AI risks.				✓		

T.Y.B.Sc. (C.S.) (Semester - V)**Major - Artificial Intelligence****Course Incharge: Mr.Prasoon Pandey****Course Outcomes**

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	A	E	C
CO1	Explain the principles of intelligent agents, search strategies, and logical Explain reasoning frameworks. (Artificial Intelligence, History and State of the Art of AI, Intelligent Agents, Knowledge representation, Reasoning and Machine Learning, Probabilistic Models, Unsupervised Learning and Reinforcement Learning.)		✓				
CO2	Apply informed and uninformed search algorithms and adversarial reasoning Apply techniques to solve AI problems. (Breadth First Search & Depth First Search Algorithm, A* Search, Decision Tree Learning, Feed Forward Backpropagation Neural Network, Support Vector Machines, Naive Bayes' Classifier, K-NN.)			✓			
CO3	Implement and evaluate basic machine learning models for classification, Analyse regression, and clustering tasks. (implement these algorithms and mechanisms using Reasoning, Planning, Fuzzy Logic, Decision Trees, SVM, ANN.)				✓		
CO4	Analyze probabilistic models including Bayesian networks and hidden variable models for uncertain scenarios. (Evaluate the Algorithms and mechanisms, Knowledge representation, Machine learning, Statistical learning, Naive Bayes Classifier.)					✓	
CO5	Assess AI systems from a responsible AI perspective, identifying bias, fairness, transparency, and generative AI risks.				✓		

T.Y.B.Sc. (C.S.) (Semester - V)

Major - Cyber and Information Security

Course Incharge: Ms. Riddhi Pandya

Course Outcomes

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	N	E	C
CO1	Explain security architecture, attack models, and fundamental cryptographic principles.		✓				
CO2	Apply symmetric and public-key cryptographic techniques (AES, RSA, Diffie-Hellman) for secure communication.			✓			
CO3	Analyse and implement authentication mechanisms including digital signatures, hash functions, MACs, and PKI-based systems.				✓		
CO4	Evaluate network and web security protocols such as SSL/TLS, IPsec, Kerberos, and email security mechanisms.					✓	
CO5	Identify and assess intrusion techniques, malware threats, DDoS attacks, and firewall configurations for effective defence.				✓		

MJEL1: Mini Project – I (Real-World Application Development)**Course Incharge: Dr. Sandeep Kamble**

CO	Course Outcomes	R	U	A	N	E	C
CO1	To identify real-world problems and perform feasibility studies, requirement analysis, and project planning using appropriate SDLC models.	✓	✓				
CO2	To design software solutions using UML diagrams, system architecture, database schema, and API design principles.		✓	✓			
CO3	To develop, integrate, test, and deploy complete software applications using suitable technologies and version control tools.			✓	✓		
CO4	To evaluate software quality through systematic testing, debugging, performance analysis, security validation, and documentation.				✓	✓	
CO5	To create a professionally documented, industry-oriented software project demonstrating technical, analytical, and presentation skills.					✓	✓

MJEL1: Software Testing & Quality Assurance**Course Incharge: Ms. Rashmitha Shettigar****Course Outcomes**

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	N	E	C
CO1	To develop understanding of software testing fundamentals and their integration within SDLC.		✓				
CO2	To introduce verification, validation, and systematic testing strategies.	✓	✓				
CO3	To provide knowledge of white-box and black-box testing techniques and defect management processes.	✓	✓				
CO4	To familiarize students with software metrics, statistical quality assurance, and reliability concepts.		✓				
CO5	To inculcate quality improvement practices and standards for professional software development.		✓	✓			

T.Y.B.Sc. (C.S.) (Semester - V)**MJELP1: Software Testing & Quality Assurance Practical****Course Incharge: Ms. Rashmitha Shettigar****Course Outcomes**

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	N	E	C
CO1	To develop proficiency in designing and executing manual and automated test cases using Selenium tools.		✓	✓			✓
CO2	To enable implementation of automation frameworks such as Page Object Model and TestNG-based testing.		✓	✓	✓		✓
CO3	To provide hands-on experience in cross-browser testing, CI integration, and load testing.		✓	✓	✓		
CO4	To strengthen understanding of defect tracking and test reporting using industry tools.		✓	✓			
CO5	To prepare students for professional QA and automation roles through tool-based implementation. .		✓	✓	✓	✓	

T.Y.B.Sc. (C.S.) (Semester - V)**VSC - IKS in Computational Systems****Course Outcomes**

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	N	E	C
CO1	Explain and interpret classical Indian knowledge frameworks as structured computational models.		✓				
CO2	Analyze Piṅgala's combinatorial methods and relate them to binary encoding, recursion, and tree structures.				✓		
CO3	Model and compare Pāṇini's generative grammar with modern formal grammars and parsing systems.				✓		
CO4	Apply Nyāya logical structures and Ayurvedic classification principles to modern inference engines and expert systems.			✓			
CO5	Relate ancient cryptographic techniques to contemporary symmetric encryption and cybersecurity foundations.				✓		

VSC - Ethical Hacking (Practical)**Course Outcomes**

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	N	E	C
CO1	Explain and analyze various cyber-attack methodologies including reconnaissance, scanning, and privilege escalation techniques				✓		
CO2	Identify and assess vulnerabilities in web applications, networks, wireless systems, and authentication mechanisms				✓		
CO3	Evaluate cryptographic weaknesses, session management flaws, and malware behaviors from a defensive standpoint.					✓	
CO4	Apply structured penetration testing methodologies and prepare professional vulnerability assessment reports.			✓			
CO5	Recommend appropriate mitigation strategies and security best practices to protect systems and networks against cyber threats.					✓	

**MINOR - Regression Analysis using R
Programming**

Course Incharge: Dr. Sreedevi V S

Course Outcomes

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	N	E	C
CO1	Gain practical knowledge of R software for statistical data analysis.		✓				
CO2	Develop skills to build and interpret regression models using real data.				✓		
CO3	Learn to diagnose and validate regression models using statistical tests.				✓		
CO4	Apply advanced regression methods to solve applied data analysis problems.			✓			

**MINOR - Practical on Regression Analysis using R
Programming**

Course Incharge: Dr. Sreedevi V S

Course Outcomes

After completing this course, students will be able to:

CO	Course Outcomes	Revised Bloom's Taxonomy Learning Levels					
		R	U	A	N	E	C
CO1	Solve the real life problem in multiple linear regression.			✓			
CO2	Solve the overall significance and individual significance of the parameters.				✓		
CO3	Solve the basic R programming code to fit regression model.			✓			