

**CURRICULUM
FOR THE ACADEMIC YEAR 2025-2026
(22 Series)**

**DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING
B.E. in COMPUTER SCIENCE & DESIGN**

B.E.VII AND VIII SEMESTER



**POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING
(An autonomous college under VTU)
KALABURAGI**

About the institution: The Hyderabad Karnataka Education (HKE) society founded by Late Shri Mahadevappa Rampure, a great visionary and educationist. The HKE Society runs 46 educational institutions. Poojya Doddappa Appa College of Engineering, Gulbarga is the first institution established by the society in 1958. The college is celebrating its golden jubilee year, setting new standards in the field of education and achieving greater heights. The college was started with 50% central assistance and 50% state assistance, and a desire to impart quality technical education to this part of Karnataka State. The initial intake was 120 with degree offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now, it houses 11 undergraduate courses, 10 post Graduate courses and 12 Research centers, established in Civil Engg., Electronics & Communication Engg, Industrial & Production Engg, Mechanical Engg, Electrical Engg., Ceramic Cement Tech., Information Science & Engg., Instrumentation Technology, Automobile Engg., Computer Sc. and Engg., Mathematics and Chemistry All the courses are affiliated to Visveswaraya Technological University, Belgaum. At present the total intake at UG level is 980 and PG level 193.

The college receives grant in aid funds from state government. A number of projects have been approved by MHRD /AICTE, Govt. of India for modernization of laboratories. KSCST, Govt. of Karnataka is providing financial assistance regularly for the student's projects.

The National Board of Accreditation, New Delhi, has accredited the College in the year 2005-08 for 09 UG Courses out of which 08 courses are accredited for three years and 01 course is accredited for five years. And second time accredited for Six Course in the year 2009-2012

Our college is one among the 14 colleges selected under TEQIP, sponsored by World Bank. It has received a grant of Rs 10.454 Crores under this scheme for its development. The institution is selected for TEQIP phase II in year 2011 for four years. Institution is receiving a grant of Rs. 12.50 Crores under TEQIP Phase -II scheme for its development and selected for TEQIP-III as mentoring Institute for BIET Jhansi(UP).

Recognizing the excellent facilities, faculty, progressive outlook, high academic standards and record performance, the VTU Belgaum reposed abundant confidence in the capabilities of the College and the College was conferred Autonomous Status from the academic year 2007-08, to update its own programme and curriculum, to devise and conduct examinations, and to evaluate student's performance based on a system of continuous assessment. The academic programmers are designed and updated by a Board of Studies at the department level and Academic Council at the college level. These statutory bodies are constituted as per the guidelines of the VTU Belgaum. A separate examination section headed by a Controller of Examinations conducts the examinations.

At present the college has acquired the Academic autonomous status for both PG and UG courses from the academic year 2007-08 and it is one among the six colleges in the state of Karnataka to have autonomous status for both UG and PG courses.

One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This is the outcome of understanding by faculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education). In the year 2000, the college was awarded as Best College of the year by KSCST, Bangalore in the state level students projects exhibition.

The college campus is spread over 71 acres of land on either side of Mumbai-Chennai railway track and has a sprawling complex with gardens and greenery all around.

About the department: The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120 students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 25 students) and PG(Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. Computer Science and Design course was started from 2021 with an intake of 60 students. The department is having state-of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

Vision of the Institution

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

- To provide a high quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical, and professional activities

Vision of the Department

- To become a premier department in Computer education, research and to prepare highly competent IT professionals to serve industry and society at local and global levels.

Mission of the Department

- To impart high quality professional education to become a leader in Computer Science and Engineering.
- To achieve excellence in Research for contributing to the development of the society.
- To inculcate professional and ethical behaviour to serve the industry.

Program Educational Objectives (PEO):

PEO1:	To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze computer science and engineering problems
PEO2:	To adapt to evolving technologies and tools for serving the society
PEO3:	To perform as team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values
PEO4:	To encourage students to pursue higher studies, engage in research and to become entrepreneurs

Program Outcomes:

- 01. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 02. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 03. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 04. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 05. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 06. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 07. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 08. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 09. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

PSO1:	Acquire competency in hardware and software working principles to design, analyze and solve computing problems.
PSO2:	Develop solution for scientific and business applications using software engineering practices.
PSO3:	Create innovative solutions from idea to product by applying cutting edge technologies using modern tools to find novel solution ethically.

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

SCHEME OF TEACHING FOR VII SEMESTER–22 SERIES (APPROVED)

B.E.(COMPUTER SCIENCE AND DESIGN)

Sl. No	Course	Course Code	Course Title	Teaching Hours/Week				Examination				Credits
				Theory Lecture(L)	Tutorial (T)	Practical	Self Study (S)	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	IPCC	22CG71	Web Development using Django	3	0	2	0	03	50	50	100	4
2	IPCC	22CG72	Web Application Security	3	0	2	0	03	50	50	100	4
3	PCC	22CG73	Cloud Computing	4	0	0	0	03	50	50	100	4
4	PEC	22CG74X	Professional Elective-III	3	0	0	0	03	50	50	100	3
5	OEC	22CGOE75X	Open Elective-II	3	0	0	0	03	50	50	100	3
6	PROJ	22CGP76	Major Project Phase-II	0	0	12	0	03	50	50	100	6
			Total	16	0	16	0	18	300	300	600	24

Professional Elective-III

S. No	Course Code	Course Name
1.	22CG741	Generative AI
2.	22CG742	Deep Learning
3.	22CG743	Metaverse
4.	22CG744	DevOp's

Open Elective- II

S. No	Course Code	Course Name
1.	22CGOE751	Data Science with Python
2.	22CGOE752	Fundamentals of Artificial Intelligence

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

SCHEME OF TEACHING FOR VIII SEMESTER–22 SERIES (TENTATIVE)

B.E.(COMPUTER SCIENCE AND DESIGN)

Sl. No	Course	Course Code	Course Title	Teaching Hours/Week				Examination				Credits
				Theory Lecture (L)	Tutorial (T)	Practical	Self Study (S)	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	PEC	22CG81X	Professional Elective-IV (Online Courses-NPTEL)	3	0	0	0	03	50	50	100	3
2	OEC	22CGOE82X	Open Elective-III (Online Courses)	3	0	0	0	03	50	50	100	3
3	INT	22CGINT83	Internship (Industry/Research) (14-20 weeks)	0	0	12	0	03	50	50	100	10
			Total	6	0	12	0	09	150	150	300	16

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

Course Title: WEB DEVELOPMENT USING DJANGO		
Subject Code: 22CG71	Credit: 03	CIE:50
Number of Lecture Hours/Week	3:0:2 Hrs	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Prerequisites: Knowledge of HTML, CSS.		
Course Learning Objectives: 1. Explain the use of learning full stack web development. 2. Make use of rapid application development in the design of responsive web pages. 3. Illustrate Models, Views and Templates with their connectivity in Django for full stack web development. 4. Demonstrate the use of state management and admin interfaces automation in Django. 5. Design and implement Django apps containing dynamic pages with SQL databases.		
MODULES		Teaching Hours
Module I MVC based Web Designing: Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLS. Lab Experiments: 1. Installation of Python, Django and Visual Studio code editors can be demonstrated. 2. Creation of virtual environment, Django project and App should be demonstrated 3. Develop a Django app that displays current date and time in server 4. Develop a Django app that displays date and time four hours ahead and four hours before as an offset of current date and time in server.		08 Hrs
Module II Django Templates and Models: Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT Development Pattern, Template Loading, Template Inheritance, MVT Development Pattern. Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String Representations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution Lab Experiments: 5. Develop a simple Django app that displays an unordered list of fruits and ordered list of selected students for an event 6. Develop a layout.html with a suitable header (containing navigation menu) and footer with copyright and developer information. Inherit this layout.html and create 3 additional pages: contact us, About Us and Home page of any website. 7. Develop a Django app that performs student registration to a course. 8. It should also display list of students registered for any selected course. Create students and course as models with enrolment as Many To Many field.		09 Hrs

Module III Django Admin Interfaces and Model Forms: Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces. Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URLConf Ticks, Including Other URLConfs. Lab Experiments: - For student and course models created in Lab experiment for Module2, register admin interfaces, perform migrations and illustrate data entry through admin forms. - Develop a Model form for student that contains his topic chosen for project, languages used and duration with a model called project.	08 Hrs
Module IV Generic Views and Django State Persistence : Using Generic Views, Generic Views of Objects, Extending Generic Views of objects, Extending Generic Views. MIME Types, Generating Non-HTML contents like CSV and PDF, Syndication Feed Framework, Sitemap framework, Cookies, Sessions, Users and Authentication. Lab Experiments: - For students enrolment developed in Module 2, create a generic class view which displays list of students and detailview that displays student details for any selected student in the list. - Develop example Django app that performs CSV and PDF generation for any models created in previous laboratory component.	09 Hrs
Module V jQuery and AJAX Integration in Django: Ajax Solution, Java Script, XMLHttpRequest and Response, HTML, CSS, JSON, iFrames, Settings of Java Script in Django, jQuery and Basic AJAX, jQuery AJAX Facilities, Using jQuery UI Autocomplete in Django Lab Experiments: - Develop a registration page for student enrolment as done in Module 2 but without page refresh using AJAX. - Develop a search application in Django using AJAX that displays courses enrolled by a student being searched.	08 Hrs
Question paper pattern: The question paper will have ten questions. There will be two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.	

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

TEXTBOOK:

1. Adrian Holovaty, Jacob Kaplan Moss, The Definitive Guide to Django: Web Development Done Right, Second Edition, Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers, 2009
2. Jonathan Hayward, Django Java Script Integration: AJAX and jQuery, First Edition, Pack Publishing, 2011

REFERENCEBOOKS:

1. Aidas Bendroraitis, Jake Kronika, Django 3 Web Development Cookbook, Fourth Edition, Packet Publishing, 2020
2. William Vincent, Django for Beginners: Build websites with Python and Django, First Edition, Amazon Digital Services, 2018
3. Antonio Mele, Django3 by Example, 3rd Edition, Pack Publishers, 2020
4. Arun Ravindran, Django Design Patterns and Best Practices, 2nd Edition, Pack Publishers, 2020.
5. Julia Elman, Mark Lavin, Light weight Django, David A. Bell, 1st Edition, Oreily Publications, 2014

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CG71	CO1	Demonstrate the Working of MVT based full Stack Web development with Django.
	CO2	Designing of Models and Forms for rapid Development of Web Pages.
	CO3	Analyze the role of Template Inheritance and generic views for development full Stack Web Applications.
	CO4	Apply The Django framework libraries to render non HTML contents like CSV and PDF
	CO5	Performs jquery based AJAX integration to Django Apps to build responsive full Stack Web Application

Course Title: WEB APPLICATION SECURITY		
Subject Code: 22CG72	Credit: 03	CIE: 50
Number of Lecture Hours/Week	3:0:2 Hrs	SEE: 50
Total Number of Lecture Hours	42	SEEHours: 03
Prerequisites: Computer Network		
Course Objectives: - Gain understanding of threat surface. - To discover security flaws in web applications.		
MODULES		Teaching Hours
Module I Web Application Insecurity And Defense Mechanism: The Evolution of Web Applications, Web Application Security, Key Problem Factors, Handling User Access, Handling User Input, Handling Attackers. Web application technologies: HTTP Protocol, Web Functionality, Encoding Schemes. Lab Experiments: - Analyse different encoding (Base64, URL, HTML) mechanisms used in application. - Analyse different encryption (MD5, SHA1, SHA2 etc) mechanisms used in application.		8 Hrs
Module II Mapping Application: Enumerating Content and functionality, Analyzing application. Bypassing Client-side controls: Transmitting Data via Client Capturing User Data: HTML FORMS, Browser Extensions. Attacking Authentication: Authentication technologies, Design flaws in authentication, Implementation flaws in authentication, Securing authentication. Lab Experiments: - Build a sitemap using the application mentioned for analysis. - Experiment to perform web application mirroring using HTTrack. - Build a checklist for Authentication and apply on the web application to analyse the outcomes.		9 Hrs
Module III Attacking Session Management: The Need for state, Weaknesses in token generation, Weaknesses in session token handling, Securing session management. Attacking Access Controls: Common vulnerabilities, Attacking access controls, Securing access controls. Lab Experiments: Build a checklist for Session management and use the same to perform manual checks on the application.		8 Hrs

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

7. Experiment to perform Sessions Hijacking using Web-Goat 8. List Horizontal Controls in the application and bypass the roles based functionalities.			
Module IV Attacking Data Stores: Injecting into interpreted contexts, Injecting into SQL, Injecting into NoSQL, Attacking Back-end components: Injecting OS Commands, Manipulating File Paths, Injecting into Back-end HTTP Requests. Lab Experiments: - Experiment to perform SQL Injection in application using manual and automated tools. - Experiment to perform OS Command Injection in application and extend the attack to gain web shell access. - Build a checklist for file path traversal attacks to access the server internal files.			9 Hrs
Module V Attacking Users: Cross-Site Scripting: Varieties of XSS, XSS Attacks in Action, Finding and Exploiting XSS vulnerabilities, Preventing XSS Attacks. Lab Experiments: - Experiment to simulate XSS attack of different types - Experiment to detect XSS attack			8 Hrs
Question paper pattern: The question paper will have ten questions. There will be Two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.			
TEXTBOOK: 1.Web Application Hacker's Handbook, Dafydd Stuttard, Marcus Pinto,Wiley,2 nd Edition,2011			
REFERENCEBOOKS: - Hacking Exposed Web Applications, Third Edition, 3rd Edition, by Joel Scambray, VincentLiu, Caleb Sima. Released October 2010. Publisher(s): McGraw-Hill. - Hacking: The Art of Exploitation by Jon Erickson, 2nd Edition, Feb 2008 - Penetration Testing: A Hands-On Introduction to Hacking Paperback by Georgia Weidman, June 2014.			
Course outcomes: On completion of the course, the student will have the ability to:			
Course Code	CO#	Course Outcome(CO)	
22CG72	CO1	Describe vulnerabilities associated with web applications.	
	CO2	Analyze the application and identify authentication design flaws	
	CO3	Evaluate session management and access control vulnerabilities and adopt security methods.	
	CO4	Demonstrate SQL and OS injection in an ethical way.	
	CO5	Illustrate nature of logic flaws in real world applications.	

Course Title: CLOUD COMPUTING		
SubjectCode: 22CG73	Credits :4	CIE:50
Number of Lecture Hours/Week	4:0:0 Hrs	SEE:50
Total Number of Lecture Hours	52	SEEHours:03
Prerequisites: Operating systems, Computer networks		
Course objectives: - To understand Virtualization and learn Cloud Services - To implement Task Scheduling algorithms. - Apply Map-Reduce concept.		
Modules		Teaching Hours
Module-I Introduction : Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google App Engine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology. Case Study Containers, Dockers.		11 Hrs
Module-II Cloud Computing Architecture, Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects Aneka: Cloud Application Platform, Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools.		10 Hrs

Module-III Concurrent Computing: Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread, Thread APIs, Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model, Domain Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent. High-Throughput Computing: Task Programming, Task Computing, Characterizing Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependencies, Aneka Task-Based Programming, Task Programming Model, Developing Applications with the Task Model, developing Parameter Sweep Application, Managing Workflows.	11 Hrs
Module-IV Data Intensive Computing: Map-Reduce Programming, What is Data-Intensive Computing, Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka Map Reduce Programming, Introducing the Map Reduce Programming Model, Example Application.	10 Hrs
Module-V Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Applications Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.	10 Hrs
Question paper pattern: The question paper will have ten questions. There will be two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.	
Text Book: 1. International Edition - Rajkumar Buyya, Christian Vecchiola, and Thamarai selvi, Mastering Cloud Computing, Morgan Kaufmann, ISBN: 978-0-12-411454-8, Burlington, Massachusetts, USA, May 2013.	

REFERENCEBOOKS

1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, 1st edition, 2014, Morgan Kaufmann Publishers, Inc., San Francisco. ISBN-13: 978-0124166752, ISBN-10: 012416675
2. T. Erl, R. Puttini, and Z. Mahmood, Cloud Computing: Concepts, Technology & Architecture ISBN-10: 0133387526 • ISBN-13: 9780133387520 ©2013 • Prentice Hall.

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
22CG73	CO1	Describe Cloud Computing setup and applications using different architecture and understand concept of Virtualization.
	CO2	Demonstrate various cloud reference models and deployment modes
	CO3	Develop and deploy cloud application using popular cloud platforms.
	CO4	Illustrate Data intensive computing and apply Map Reduce
	CO5	Describe the importance of cloud computing driven commercial systems.

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

COURSE TITLE: GENERATIVE AI		
Subject Code: 22CG741	Credits:3	CIE:50
Number of Lecture Hours/Week(L:T:P)	3:0:0Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours:3 Hrs
Prerequisites:		
Course Objectives: • Understand the basics of Generative AI. • Know the basics of Text Generation. • Understand the process of generating videos. • Know about GAN and its variants. • Understand and Apply Gen AI tools.		
MODULES		Teaching Hours
Module-I		
INTRODUCTION TO GEN AI: Historical Overview of Generative modelling - Difference between Gen AI and Discriminative Modeling – Importance of generative models in AI and Machine Learning – Types of Generative models – GANs, VAEs, autoregressive models and Vector quantized Diffusion models - Understanding if probabilistic modelling and generative process - Challenges of Generative Modelling – Future of Gen AI – Ethical Aspects of AI – Responsible AI – Use Cases.		9 Hrs
Module-II		
GENERATIVE MODELS FOR TEXT : Language Models Basics – Building blocks of Language models - Transformer Architecture – Encoder and Decoder – Attention mechanisms - Generation of Text – Models like BERT and GPT models – Generation of Text - Auto encoding – Regression Models – Exploring ChatGPT – Prompt Engineering – Designing Prompts– Revising Prompts using Reinforcement Learning from Human Feedback (RLHF) - Retrieval Augmented Generation – Multimodal LLM – Issues of LLM like hallucination.		9 Hrs
Module-III		
GENERATION OF IMAGES : Introduction to Generative Adversarial Networks – Adversarial Training Process – Nash Equilibrium – Variation Auto encoders – Encoder-Decoder Architectures - Stable Diffusion Models – Introduction to Transformer-based Image Generation – CLIP – Visual Transformers ViT- Dall-E2 and Dall-E3, GPT-4V – Issues of Image Generation models like Mode Collapse and Stability.		8 Hrs
Module-IV		
GENERATION OF PAINTING, MUSIC, AND PLAY : Variants of GAN – Types of GAN - Cyclic GAN – Using Cyclic GAN to Generate Paintings – Neural Style Transfer – Style Transfer - Music Generating RNN – MuseGAN – Autonomous agents – Deep Q Algorithm – Actor-critic Network.		8 Hrs

Module–V OPEN SOURCE MODELS AND PROGRAMMING FRAMEWORKS: Training and Fine tuning of Generative models – GPT4All - Transfer learning and Pretrained models - Training vision models – Google Copilot - Programming LLM – LangChain – Open Source Models – Llama - Programming for TimeSformer – Deployment – Hugging Face.		8 Hrs
Question paper pattern: The question paper will have ten questions. There will be two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.		
Text Books: 1. Denis Rothman, “Transformers for Natural Language Processing and Computer Vision”, Third Edition ,Packt Books, 2024		
Reference Books: 1. David Foster, ”Generative Deep Learning”, O’Reily Books, 2024. 2. Altaf Rehmani, “Generative AI for Everyone”, BlueRose One, 2024.		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO#	Course Outcome(CO)
22CG741	CO1	Describe the concepts of Generative Modelling.
	CO2	Apply Gen AI to Generating Texts.
	CO3	Apply Gen AI for generating video
	CO4	Illustrate concepts of Generative adversal networks.
	CO5	Apply Open Source Tools for solving problems using Gen AI.

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

Course Title: DEEP LEARNING		
Subject Code: 22CG742	Credits: 3	CIE: 50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Pre-requisites: Machine learning		
Course objectives - Understand complexity of Deep Learning algorithms and their limitations. - Be capable of performing experiments in Deep Learning using real-world data.		
MODULES		Teaching Hours
Module– I Introduction to Deep Learning: Introduction to deep learning , Biological & artificial neurons ANN & its layer, Exploring activation functions, Forward propagation in ANN, How does ANN learn ,Debugging gradient descent with gradient checking. Getting to Know TensorFlow: Introduction to TensorFlow, Understanding computational graphs and sessions, Variables, constants and placeholders, Introducing TensorBoard , Handwritten digit classification using TensorFlow , Introducing eager execution, Math operations in TensorFlow, TensorFlow 2.0 and Keras, Keras or TensorFlow.		09 Hrs
Module-II Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory, Generating Song Lyrics Using RNN, Introducing RNNs Generating song lyrics using RNNs, Different types of RNN architectures.		08 Hrs
Module– III Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types. Demystifying Convolutional Networks: Demystifying Convolutional Networks, The math behind CNNs, Implementing a CNN in TensorFlow, CNN architectures, Capsule networks, Building Capsule networks in TensorFlow. Case study.		08 Hrs
Module– IV Learning Text Representations: Learning Text Representations, Understanding the word2vec model, Building the word2vec model using gensim, Visualizing word embeddings in Tensor Board, Doc2vec Understanding, skip-thoughts algorithm, Quick- thoughts for sentence embeddings.		09 Hrs
Module-V Generating Images Using Generative Adversarial Networks: Generating Images Using GANs, Differences between discriminative and generative models. DCGAN – Adding convolution to a GAN, Deconvolution generator, convolutional discriminator. Learning More about GANs: Conditional GAN, Loss Function of CGAN,		08 Hrs

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

Generating specific digits using CGAN, Understanding InfoGAN, Exploring Mutual Information, Architecture of InfoGAN, Translating images using CycleGAN, Role of generators, Role of discriminators, Loss Function, Cycle Consistency Loss, Stack GAN, Architecture of StackGANs. Introduction to auto encoder.		
Question paper pattern: The question paper will have ten questions. There will be two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.		
TEXT BOOKS: 1. Sudharsan Ravichandiran, “Hands on deep learning algorithms with python”, Packt Publishing , July 2019, ISBN: 9781789344158. 2. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016		
REFERENCE BOOKS: 1. Raúl Rojas Neural Networks: Asystematic Introduction 1996. 2. Chirstopher Bishop Pattern Recognition and machine Learning 2007. 3. Francois Chollet, Deep Learning with Python, Manning Publications, 2018.		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO#	Course Outcome(CO)
22CG742	CO1	Explain the concepts of Deep Learning, Use TensorFlow, its main functions, operations and the execution pipeline.
	CO2	Design Recurrent Neural Networks(RNN), Implement different architectures of RNN in Tensorflow.
	CO3	Demonstrate the working of convolutional neural networks, Implement CNN with Tensorflow.
	CO4	Demonstrate Text Representations and Build the word2vec model using gensim and interpret the results.
	CO5	Build different architectures of Generative Adversarial Networks in Tensorflow.

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

Course Title: METAVERSE		
Subject Code: 22CG743	Credits : 3	CIE: 50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Knowledge of hardware like PC and mobile device, software - coding languages like python etc		
Course Objectives: • To understand the History of Metaverse. • Explore the role of Metaverse to connect the real world and blockchain. • To understand the advanced development of blockchain in the future. • To study an open ecosystem of smart properties and assets. • To explore the integration of futuristic technologies such as blockchain, crypto currency, DAO, AR/VR		
Modules		Teaching Hours
Module - I		
Introduction To Metaverse: Introduction to Metaverse and immersive experience- History of Metaverse- Metaverse value chainwith 7 layer		09 Hrs
Module – II		
TECHNOLOGIES INVOLVED IN THE METAVERSE : Metaverse as a product of Extended Reality- Augmented Reality (AR)- Virtual Reality (VR)- Benefits of AR/VR-Difference between AR/ VR - Mixed Reality (MR)-Artificial Intelligence (AI) Introduction in Metaverse-Financial and Economics of Metaverse- Benefits of Metaverse		09 Hrs
Module –III		
BLOCKCHAIN ADOPTION IN METAVERSE: Blockchain Overview-History of Blockchain-Need of Decentralization in MV-Smart Contract Capabilities in Blockchain - Blockchain in Metaverse -Understanding Tokens-Understanding the NFT-NFT Token Standards-NFT		08 Hrs
Module -IV		
AR, VR, AND MR IN METAVERSE: Everything about VR (Virtual Reality)- Everything about AR (Augmented Reality)-Everything about MR (Mixed Reality)- Block chain Identity Management in Metaverse -NFT (non-fungible token) for Metaverse-Introduction to NFTs-History of NFTs-Benefits of NFTs		08 Hrs
Module - V		
USE-CASES: Gaming in Metaverse-Meetings in Metaverse-Virtual Learning in Metaverse-Social Interactions in Metaverse-Virtual Real-estate in Metaverse-e-commerce in Metaverse-Travel in Metaverse- Personalized Avatars-Digital Identity in Metaverse		08 Hrs

Question paper pattern: The question paper will have ten questions. There will be two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.		
Text Books : 1. The Metaverse: And How It Will Revolutionize Everything Kindle Edition by Matthew Ball Publisher : Liveright ,2022. 2. The Metaverse Handbook: Innovating for the Internet's Next Tectonic Shift Kindle Edition by QuHarrison Terry (Author), Scott Keeney (Author), Paris Hilton (Foreword), Publisher: Wiley; 1st edition ,2022.		
Reference Books : 1. The Wearable Technology Handbook, Haider Raad, scholar publcialtions,2017. 2. Metaverse Made Easy: A Beginner's Guide to the Metaverse, Dr.Liew VoonKiong, Publisher, Liew Voon Kiong, 2022. 3. Metaverse For Beginners and Advanced: A Complete Journey Into the Metaverse Virtual World (Web 3.0), Darell Freeman, Publisher Darell Freeman,2022. 4. Metaverse Glossary - Your Gateway to the Future ,Publishing, 2022 . 5. The Metaverse: Prepare Now for the Next Big Thing Paperback , Terry Winters , Winters media Publication 2021		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
22CG743	CO1	Describe metaverse and its history
	CO2	Explore the technologies involved in the metaverse
	CO3	Explain blockchain, its history and need of blockchain in metaverse
	CO4	Integrate AR, VR, MR and block chain, identity management in metaverse
	CO5	Discuss case studies of metaverse

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

COURSE TITLE: DEVOP'S		
Subject Code: 22CG744	Credits: 03	CIE: 50
Number of Lecture Hours/Week(L:T:P)	3:0:0Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours: 3
Prerequisites: Cloud computing, Networking		
Course Objectives: - To understand DevOps working environment and AWS Services - To learn about Virtualizations and Kubernetes		
MODULES		Teaching Hours
Module-I Fundamentals of DevOps and Version Control: What Is DevOps, History and Objectives DevOps. Version Control: GIT Installation, Version control systems, Version Control System types, Difference between CVCS and DVCS, Introduction and Importance of Git, Common commands in Git, Working with Remote Repositories, Branching and Merging in Git, Git workflows and cheat sheet.		8 hrs
Module-II AWS Services: Introduction to AWS, use cases of AWS in companies. Amazon VPC (Virtual Private Cloud) - CIDR Blocks, Private & Public Subnet, Route Tables, Security Groups, Internet & NAT Gateway. Amazon Elastic Compute Cloud (EC2) - Instance Types, CPU Credits, Storage / Volumes (EBS), Keypairs, Elastic IP. IAM (Identity and Access Management) - Policies in Amazon IAM, Users / User Groups, IAM Roles in AWS. Amazon S3 (Simple Storage Service) - Buckets / Objects, Bucket / Object Lifecycle, Storage Types/Storage Classes (Standard) Amazon CloudWatch - Metrics, AWS CloudWatch Events, AWS Cloud-Watch Logs. Basics of Auto Scaling - Amazon Machine Images (AMIs), Launch Templates, Auto-Scaling Groups/Policies, Load Balancers.		10 hrs
Module-III Continuous Integration and micro services : Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Continuous integration tools. Jenkins and its Architecture, Jenkins Management, Build Setup, Git and Jenkins Integration, Build & Test Applications with Continuous Integration, Scheduling build Jobs, AWS Code build, AWS Code deploy, Code Pipeline and micro service.		8 hrs

Module–IV Virtualization & Containerization: Benefits and use cases for containerized environments. Introduction to Docker, use case of Docker, Platforms for Docker, Dockers vs. Virtualization, understanding images and containers. Introduction to Container, Container Life Cycle Installing and Configure Docker for creating Containers. Operating Systems, Build, deploy and manage web or Java application on Docker, Container environment using a Docker file.			8 Hrs
Module–V Introduction to Kubernetes, Kubernetes Architecture, Types of Objects in Kubernetes – Deployment, Replica Sets, Stateful Set, Daemon Sets, Persistent Volume, Service, Namespaces, Config Maps & Secrets, Job. Kubernetes Cluster – AWS EKS Cluster.			8 Hrs
Question paper pattern: The question paper will have ten questions. There will be two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.			
Text Books: 1. DevOps Bootcamp, Sybgen Learning, 2017 2. Karl Matthias & Sean P. Kane, Docker: Up and Running, O'Reilly Publication, September 2024 3. AWS Certified Solutions Architect Official Study Guide: Associate Exam by Joe Baron 2016			
Reference Books: 1. Learning Aws - Second Edition: Design, build, and deploy responsive applications using AWS by Amit Shah Aurobindo Sarkar, 2018 2. Sanjeev Sharma and Bernie Coyne,” DevOps for Dummies”, Wiley Publication,2013 3. Hattermann, Michael, “DevOps for Developers' ', Publication, 2012 4. Joakim Verona, “Practical DevOps”, Pack publication,2018			
Course outcomes: On completion of the course, the student will have the ability to:			
Course Code	CO#	Course Outcome(CO)	
22CG744	CO1	Describe about Development Operations (DevOps).	
	CO2	Illustrate the Amazon Web services	
	CO3	Demonstrate the Continuous Integration and micro services	
	CO4	Apply Virtualization & Containerization technology	
	CO5	Explain Kubernetes Architecture and Deployments.	

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

COURSE TITLE: DATA SCIENCE WITH PYTHON		
Subject Code:22CGOE751	Credits:03	CIE:50
Number of Lecture Hours/Week(L:T:P)	3:0:0Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03
Prerequisites:Nil		
Course Objectives: Learn the basics of Data and extract valuable information for use in strategic decision making and trend analysis.		
MODULES		Teaching Hours
Module-I A Crash Course in Python: The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries, default dict, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object-Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations. Visualizing Data: Matplotlib, bar Charts, Line Charts, Scatterplot.		09 Hrs
Module-II Introduction: AI, Machine Learning and Data Science, what is data science, Case for data science, Data science classification, Data science algorithms. Data science process: Prior knowledge, Data preparation, Modeling, Application, Knowledge		08 Hrs
Module-III Data Exploration: Objectives of Data exploration, Datasets, Descriptive statistics, Data Visualization, Roadmap for data exploration. Classification-1: Decision Trees, Rule Induction.		08 Hrs
Module-IV Classification-2: k-Nearest Neighbors, Naïve Bayesian, Artificial Neural Networks.		08 Hrs
Module-V Regression Methods: Linear Regression, Logistic Regression, Conclusion.		09 Hrs
Question paper pattern: The question paper will have ten questions. There will be two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.		
Text Books: 1. Data Science Concepts and Practice , Second Edition, Vijay Kotu and Bala Deshpande, Elsevier Inc. 2019. 2. Data Science from Scratch , First Principles with Python, by Joel Grus, Publisher(s): O'Reilly, 2015		

Reference Books:

1. **Doing Data Science** by Cathy O’Neil, Rachel Schutt, Released October 2013, Publisher(s): O’Reilly Media.
2. **Foundation of Data Science** by Avrim Blum, John Hopcroft and Ravindran Kannan, Cambridge University Press, 2020.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22CGOE751	CO1	Develop relevant programming abilities using Python for data science applications.
	CO2	Explain the fundamentals of data science, machine learning, and the data science process
	CO3	Perform data exploration, visualization, and statistical analysis on datasets.
	CO4	Implement classification techniques such as Decision Trees, k-Nearest Neighbors, and Naïve Bayes.
	CO5	Apply regression methods like Linear and Logistic Regression for predictive modeling.

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

COURSE TITLE: FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE		
Subject Code: 22CGOE752	Credits:03	CIE:50
Number of Lecture Hours/Week(L:T:P)	3:0:0Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03
Prerequisites: Nil		
Course Objectives: - Identify the problems where AI is required and the different methods available. - Compare and contrast different AI techniques available. - Know the applications of Artificial Intelligence. - Define and explain learning algorithms		
MODULES		Teaching Hours
Module-I Introduction To AI: Introduction, Definition of AI, Goals of AI, Turing Test, Applications of AI, AI Programming Languages, Introduction, Intelligent Systems, the Concept of rationality, types of Agents, Environments and its properties, PEAS		09 Hrs
Module-II Problem Solving And Searching: Introduction to Problem Solving, Problem Formulation, State Space Representation, Problem Formulation of real world problems, Production System, Problem Characteristics, Solving problems by searching.		08 Hrs
Module-III Uninformed Search Strategies: Introduction, Brute Force or Blind Search, Breadth-First Search, Depth- First Search. Informed Search Strategies: Introduction, Hill Climbing, Best- First Search (Greedy Search), A* Search, AO* Search.		08 Hrs
Module-IV Knowledge And Reasoning: A Knowledge-Based Agent, The Wumpus World Knowledge Representation Issues Predicate Logic: Representation of Simple Fact in Logic, Representing Instance and Is_A Relation, Computable Functions and Predicate Logic , Resolution, Knowledge Engineering in First-Order Logic, Unification. Representation Knowledge Using Rules: Propositional Logic, First-Order Logic/Predicate Logic.		08 Hrs
Module V Expert System: Need and Justification of ES, Knowledge Representation, Knowledge Acquisition and Variation, Utilization and Functionality. Artificial Neural Network: Introduction to Artificial Neural Networks, Basic Models of Artificial Neural Networks, First Artificial Neurons: McCulloch–Pitts Model, Neural Network Architecture, Single-Layer Feedforward ANN, Multilayer Feedforward ANN.		09 Hrs

Curriculum for B.E VII–VIII Semester-22 Series(CSD) Syllabus 2025-2026

Application Introduction Category of Applications of AI Robotics Artificial Neural Network AI Trends in Various Sectors More About Agents of AI.		
Question paper pattern: The question paper will have ten questions. There will be two questions from each module, covering all the topics from a module. The students will have to answer five full questions, selecting one full question from each module.		
Text Books: 1. Dr. Nilakshi Jain,” Artificial Intelligence making a system intelligent”, Wiley Emerging Technology Series 2021 by Wiley India Pvt. Ltd. 2.Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw-Hill, 3rd Edition 2008.		
Reference Books: 1. Artificial Intelligence and Expert Systems Development by D W Rolston-Mc Graw hill. N.P. Padhy “Artificial Intelligence and Intelligent Systems” , Oxford University Press-2015 2. Understanding Artificial Intelligence: Fundamentals and Applications, Albert Chun-Chen Liu, Oscar Ming Kin Law, Iain Law, Wiley 2022.		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO#	Course Outcome(CO)
22CGOE752	CO1	Describe artificial intelligence concepts and techniques.
	CO2	Discuss problem formulation and solving by searching methods
	CO3	Demonstrate uninformed and informed search strategies.
	CO4	Apply knowledge representation techniques and predicate Logic rules to solve reasoning problems.
	CO5	Describe Expert Systems and understand ANN basics and AI Applications.

Course Title: MAJOR PROJECT PHASE - II		
Subject Code: 22CGP76	Credit:6	CIE:50
Number of Practical Hours/Week	2 Hrs	SEE:50
		SEE Hours:03
Course Objectives: ● Gain and revise the knowledge of contemporary issues through literature surveys. ● Formulate, design and implement the solutions to real world problems. ● Apply programming skills to bring out solutions to global, economic, environmental and societal problems. ● Apply modern technologies and engineering tools. ● Effectively communicate verbally and literally. ● Work individually and as a team member in multidisciplinary domains with ethical standards.		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO#	Course Outcome(CO)
22CGP76	CO1	Apply basic engineering knowledge and identify the problem either individually or as a group
	CO2	Apply Engineering skills to solve problems of Engineering applications
	CO3	Evaluate the knowledge of contemporary issues through literature survey and formulate the problems
	CO4	Design the problem using software methodology.
	CO5	Prepare a well organized report.

B.E VIII SEMESTER

Course Title : Professional Elective-IV (Online Courses) –NPTEL		
Subject Code : 22CG81X		Credit :3
		CIE: 50
		SEE: 50
LIST OF PROFESSIONAL ELECTIVE – IV (Online Courses) NPTEL		
Sl. No	Course Code	Course Name
1	22CG811	Advanced R Programming for Data Analytics in Business
2	22CG812	Data Analytics with Python
3	22CG813	Computer Vision
4	22CG814	Affective Computing
5	22CG815	Advance Computer Architecture
6	22CG816	Business Intelligence and Analytics
7	22CG817	Foundations of Virtual Reality
8	22CG818	Advanced Distributed System
9	22CG819	Responsible & Safe AI Systems
10	22CG820	Practical Cyber Security for Cyber Security Practitioners
11	22CG821	Introduction to Large Language Models (LLMs)
12	22CG822	Cyber Security and Privacy
13	22CG823	Privacy and Security in Online Social Media
14	22CG824	Social Network Analysis

Course Title : Open Elective-III (Online Courses) NPTEL		
Subject Code : 22CGOE82X	Credit :3	CIE: 50
		SEE: 50
LIST OF OPEN ELECTIVE-III (Online Courses) NPTEL		
Sl. No	Course Code	Course Name
1	22CGOE821	Introduction to Wireless and Cellular Communications (Discipline: Electrical and Electronics Engineering)
2	22CGOE822	Pattern Recognition and Application (Discipline: Electrical and Electronics Engineering)
3	22CGOE823	Entrepreneurship (Discipline: Management)
4	22CGOE824	E-Business (Discipline: Management)
5	22CGOE825	Learning Analytics Tools (Discipline: Multidisciplinary)
6	22CGOE826	Understanding Incubation and Entrepreneurship (Discipline: Design Engineering)
7	22CGOE827	Semi-Conductor Devices and Circuits
8	22CGOE828	Environment and Social Development