

Course Handout

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|------------------------------|---|-----------------------|-----------------------|
| Institute/School Name | Chitkara University Institute of Engineering and Technology | | |
| Department Name | Department of Computer Science & Engineering | | |
| Programme Name | Bachelor of Engineering (B.E.) - Computer Science & Engineering (Artificial Intelligence) | | |
| Course Name | Web Development Framework Using Python | Session | 2024-25 |
| Course Code | 24CAI1105 | Semester/Batch | 2 nd /2024 |
| L-T-P (Per Week) | 2-0-4 | Course Credits | 4 |
| Pre-requisite | Python, HTML, SQL | NHEQF Level | 4.5 |
| Course Coordinator | Dr. Gagandeep | SDG Number | 4, 9 |

1. Objectives of the Course

This course provides a comprehensive journey through web development, introducing fundamental concepts, client-server architecture, and differentiating front-end from back-end.

- To create applications, routing, and templates using Flask. Advanced Flask explores database integration, user authentication, and building RESTful APIs.
- To learn about project setup, database management, and advanced features like user authentication using Django.
- To build a full-featured web application, working with Django REST Framework, and mastering deployment strategies.
- Students gain hands-on experience in Python, fostering practical skills in implementing diverse web development strategies for real-world scenarios.

2. Course Learning Outcomes (CLOs)

Student should be able to:

| | CLOs | Program Outcomes (PO) | NHEQF Level Descriptor | No. of Lectures |
|----------------------------|--|------------------------------|-------------------------------|------------------------|
| CLO01 | Develop dynamic and secure web applications using Flask, covering routing, form handling, and integration with databases. | PO1, PO10 | Q1, Q2 | 8 |
| CLO02 | Demonstrate advanced proficiency in Flask by implementing database management, CRUD operations using Flask-SQLAlchemy, and secure user authentication. | PO5, PO8 | Q2, Q3 | 12 |
| CLO03 | Understand and implement Django fundamentals, including project setup, models, database integration, views, templates, and form handling, to create robust web applications. | PO3, PO10 | Q2, Q3 | 10 |
| CLO04 | Design and deploy feature-rich Django applications, incorporating user profiles, RESTful APIs using Django REST Framework, and deployment across multiple platforms. | PO6, PO8, PO10, PO11 | Q3, Q4, Q5 | 10 |
| CLO05 | Optimize and scale Django applications for production, focusing on performance tuning, deployment strategies, and scalability best practices. | PO7, PO11, PO12 | Q4, Q5 | 14 |
| CLO06 | Evaluate the performance and security of web applications, applying industry standards and practices to ensure high-quality software. | PO9, PO12 | Q3, Q4, Q5, Q6 | 10 |
| Total Contact Hours | | | | 60 |

CLO-PO-PSO Mapping

| CLO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 | Type of Assessment's |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------|-------|-------|----------------------|
| CLO01 | M | | | | | | | | | H | | | M | L | L | Formative |
| CLO02 | | | | | M | | | H | | | | | M | L | M | Formative |
| CLO03 | | | H | | | | | | | H | | | H | H | M | Formative |
| CLO04 | | | | | | M | | L | | H | H | | L | M | M | Formative |
| CLO05 | | | | | | | M | | | | H | H | H | L | H | Formative |
| CLO06 | | | | | | | | | L | | | H | H | M | M | Formative |

H=High, M=Medium, L=Low

<<24CAI1105 / Web Development Framework Using Python>>

3. Recommended Books:

B01: Miguel Grinberg, Flask Web Development: Developing Web Applications with Python 2nd Ed, 2018, O'Reilly Media, Inc..

B02: Miguel Grinberg, SQLAlchemy 2 In Practice: Learn to program relational databases in Python step-by-step, Narosa Publishing House, 2018.

B03: Jacob Kaplan-Moss, Adrian Holovaty, S. Haykin, The Definitive Guide to Django: Web Development Done Right, 2nd Ed, Pearson Education, 1999.

B04: Michael Dinder, Becoming an Enterprise Django Developer : Discover best practices, tooling, and solutions for writing and organizing Django applications in production, Packt Publishing 1st Ed, 2022.

4. Other readings and relevant websites:

| Serial No | Link of Journals, Magazines, websites and Research Papers |
|-----------|---|
| 1. | https://developer.mozilla.org/en-US/docs/Web/HTML |
| 2. | https://bennettfeely.com/flexplorer/ |
| 3. | https://onlinecourses.swayam2.ac.in/nou24_cs09/preview |
| 4. | https://javascript.com/ |
| 5. | https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model |

5. Recommended Tools and Platforms

Python, Jupyter Notebook, Visual Studio Code, Anaconda, and Python libraries

6. Course Plan

| Lect. No. | Topics |
|-----------|---|
| 1-2 | Introduction to Web Development: Understanding the basics of web development, Overview of client-server architecture, Introduction to front-end and back-end development |
| 3-4 | Introduction to Python Flask: What is Flask and its advantages, Setting up a development environment, Creating your first Flask application, Routing and URL handling in Flask |
| 5-8 | Templates and Views: Creating templates with Jinja2, Rendering dynamic content, Using Flask views for handling HTTP requests |
| 9-10 | Form Handling and Data Storage: Working with HTML forms, Receiving and processing form data, Storing data in memory and basic data persistence |
| 11-14 | Advanced Flask Development: Working with Databases, Introduction to SQLite or other databases, Integrating databases with Flask, CRUD operations with Flask-SQLAlchemy |
| 15-16 | User Authentication and Authorization: User registration and login systems, Securing routes and resources, Role-based access control |
| 17-19 | RESTful APIs with Flask: Building RESTful web services, Creating endpoints for data manipulation, Handling JSON requests and responses |
| 20-23 | Continuous Evaluation Assignment-1 (Syllabus covered from Lecture to 1-19) |
| 24-26 | Introduction to Django: Getting Started with Django: What is Django and its features, Setting up a Django project, Understanding the Django project structure, Creating your first Django app |
| 27-32 | Models and Databases in Django: Defining models and database tables, Migrations and database schema changes, Querying the database using Django ORM |
| 33-36 | Views, Templates, and Forms: Building views and URL patterns, Creating templates with Django template language, Handling HTML forms and form validation |

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|-------|---|
| 37-39 | Admin Interface and User Authentication: Using Django's admin interface, Implementing user authentication and registration, Customizing user models and authentication backends |
| 40-43 | Continuous Evaluation Assignment-2 (Syllabus covered from Lecture to 24-39) |
| 44-48 | Advanced Django Development: Building a Full-Featured Web Application Building a complete web application with Django, Creating user profiles and user-specific features |
| 49-54 | Working with Django REST Framework: Building RESTful APIs with Django REST Framework, Serialization and deserialization of data, Integrating APIs with Django views |
| 54-56 | Deployment and Scaling: Preparing your Django application for production, Deploying Django applications on various platforms, Scaling and performance optimization techniques |
| 57-60 | Final Evaluation – FULL SYLLABUS |

7. Delivery/Instructional Resources Theory Plan:

| Lect. No. | Topics | CLO | Book No, CH No, Page No | TLM | ALM | Web References | Audio-Video |
|-----------|--|------------|---|--|--|---|---|
| 1-2 | Introduction to Web Development: Understanding the basics of web development, Overview of client-server architecture, Introduction to front-end and back-end development | CLO1, CLO2 | Book 1, Ch 1 (5-12), Ch 2 (15-20), Ch 3 (25-30) | Lecture slides, textbook content, diagrams, case studies, online tutorials, IDE setup guides | Hands-on: Create a static webpage; Group activity: Analyze client-server workflow; Practical: Build a webpage and discuss server-side processing | https://flask.palletsprojects.com/en/3.0.x/?ref=blog.apps.eed.us | https://www.youtube.com/watch?v=mqhxxeeTbu0&list=PLzMcbGfZo4-n4vJJybUVV3Un_NFS5EOgX |
| 3-4 | Introduction to Python Flask: What is Flask and its advantages, Setting up a development environment, Creating your first Flask application, Routing and URL handling in Flask | CLO1 | Book 1, Ch 1 (5-15), Ch 2 (16-25), Ch 3 (26-35), Ch 4 (36-45) | Lecture slides, textbook content, Flask documentation, online tutorials | Hands-on: Set up a Flask environment, create a simple Flask application, and implement routing and URL handling | https://flask.palletsprojects.com/en/3.0.x/quickstart/#a-minimal-application | https://www.youtube.com/watch?v=mqhxxeeTbu0&list=PLzMcbGfZo4-n4vJJybUVV3Un_NFS5EOgX |
| 5-8 | Templates and Views: Creating templates with Jinja2, Rendering dynamic content, Using Flask views for handling HTTP requests | CLO1 | Book 1, Ch 5 (50-60), Ch 6 (61-70) | Lecture slides, textbook content, Jinja2 documentation, Flask views examples | Hands-on: Create templates with Jinja2, render dynamic content, implement Flask views to handle HTTP requests | https://flask.palletsprojects.com/en/3.0.x/tutorial/views/ | https://www.youtube.com/watch?v=9MHYHgh4jYc&list=PLzMcbGfZo4-n4vJJybUVV3Un_NFS5EOgX&index=4 |



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|-------|---|------|------------------------------------|---|---|--|---|
| 9-10 | Form Handling and Data Storage: Working with HTML forms, Receiving and processing form data, Storing data in memory and basic data persistence | CLO1 | Book 1, Ch 7 (71-80), Ch 8 (81-90) | Lecture slides, textbook content, HTML form examples, Flask documentation | Hands-on: Create HTML forms, process form data, store data in memory and implement basic data persistence | https://flask.palletsprojects.com/en/3.0.x/ | https://www.youtube.com/watch?v=9MHYHgh4jYc&list=PLzMbGfZo4-n4vJJybUVV3Un_NFS5EOgX&index=4 |
| 11-14 | Advanced Flask Development: Working with Databases, Introduction to SQLite or other databases, Integrating databases with Flask, CRUD operations with Flask-SQLAlchemy | CLO2 | Book 2, Ch 9 (91-110) | Lecture slides, textbook content, SQLAlchemy documentation, Flask-SQLAlchemy examples | Hands-on: Work with databases, integrate SQLite with Flask, and perform CRUD operations with Flask-SQLAlchemy | https://flask.palletsprojects.com/en/3.0.x/patterns/sqlite3/ https://flask-sqlalchemy.palletsprojects.com/en/3.0.x/quickstart/ | https://www.youtube.com/watch?v=uZnp21fu8TQ&list=PLzMbGfZo4-n4vJJybUVV3Un_NFS5EOgX&index=7 |
| 15-16 | User Authentication and Authorization: User registration and login systems, Securing routes and resources, Role-based access control | CLO2 | Book 2, Ch 10 (111-130) | Lecture slides, textbook content, Flask authentication libraries, role-based access resources | Hands-on: Implement user registration, login systems, secure routes, and role-based access control | https://www.digitalocean.com/community/tutorials/how-to-add-authentication-to-your-app-with-flask-login https://www.geeksforgeeks.org/flask-role-based-access-control/ | https://www.youtube.com/watch?v=71EU8gnZqZQ |
| 17-23 | RESTful APIs with Flask: Building RESTful web services, Creating endpoints for data manipulation, Handling JSON requests and responses | CLO2 | Book 2, Ch 11 (131-150) | Lecture slides, textbook content, Flask REST API tutorials | Hands-on: Build RESTful web services, create endpoints, and handle JSON requests and responses | https://flask-restful.readthedocs.io/en/latest/ | https://www.youtube.com/watch?v=Jzv3G5iDLvw |
| 24-26 | Introduction to Django: Getting Started with Django: What is Django and its features, Setting up a Django project, Understanding the Django project structure, Creating your first Django app | CLO3 | Book 3, Ch 1 (5-20) | Lecture slides, Django documentation, Django setup guide | Hands-on: Set up a Django project, create a Django app, and understand project structure | https://www.djangoproject.com/start/ | https://youtube.com/playlist?list=PLVBKjEIdL9bvCdI4l1Emvbezv10GjUaLk&si=BmBhBA29yvmYyYU |
| 27-32 | Models and Databases in Django: Defining models and database tables, Migrations and database schema changes, Querying the database using Django ORM | CLO3 | Book 3, Ch 2 (21-40) | Lecture slides, textbook content, Django ORM examples | Hands-on: Define models, perform migrations, and query the database with Django ORM | https://docs.djangoproject.com/en/5.0/topics/db/models/ | https://youtube.com/playlist?list=PLVBKjEIdL9bvCdI4l1Emvbezv10GjUaLk&si=BmBhBA29yvmYyYU |

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|-------|---|------------|------------------------|---|--|---|---|
| 33-36 | Views, Templates, and Forms: Building views and URL patterns, Creating templates with Django template language, Handling HTML forms and form validation | CLO3 | Book 3, Ch 3 (41-60) | Lecture slides, Django template documentation, HTML form examples | Hands-on: Build views, create templates, and validate HTML forms with Django | https://docs.djangoproject.com/en/5.0/topics/forms/ | https://youtube.com/playlist?list=PLVBKjEIdL9bvCdI4l1Emvbezv10GjUaLk&si=BmBhBA29yvnmyYyU |
| 37-43 | Admin Interface and User Authentication: Using Django's admin interface, Implementing user authentication and registration, Customizing user models and authentication backends | CLO3 | Book 3, Ch 4 (61-80) | Lecture slides, Django admin interface guide, user authentication resources | Hands-on: Use Django's admin interface, implement user authentication, and customize user models | https://docs.djangoproject.com/en/5.0/topics/auth/customizing/ | https://youtube.com/playlist?list=PLVBKjEIdL9bvCdI4l1Emvbezv10GjUaLk&si=BmBhBA29yvnmyYyU |
| 44-48 | Advanced Django Development: Building a Full-Featured Web Application Building a complete web application with Django, Creating user profiles and user-specific features | CLO4 | Book 3, Ch 5 (81-100) | Lecture slides, Django project examples, real-world case studies | Hands-on: Build a full-featured web application with Django | https://developer.mozilla.org/en-US/docs/Learn/Server-side/Django/Home_page | https://youtube.com/playlist?list=PLVBKjEIdL9bvCdI4l1Emvbezv10GjUaLk&si=BmBhBA29yvnmyYyU |
| 49-54 | Working with Django REST Framework: Building RESTful APIs with Django REST Framework, Serialization and deserialization of data, Integrating APIs with Django views | CLO4, CLO5 | Book 3, Ch 6 (101-120) | Lecture slides, Django REST Framework documentation | Hands-on: Build RESTful APIs, serialize data, and integrate APIs with Django views | https://www.moesif.com/blog/technical/api-development/Django-REST-API-Tutorial/ | https://youtube.com/playlist?list=PLVBKjEIdL9bvCdI4l1Emvbezv10GjUaLk&si=BmBhBA29yvnmyYyU |
| 54-60 | Deployment and Scaling: Preparing your Django application for production, Deploying Django applications on various platforms, Scaling and performance optimization techniques | CLO4, CLO5 | Book 3, Ch 7 (121-140) | Lecture slides, Django deployment guides, optimization resources | Hands-on: Deploy Django apps on various platforms and optimize performance | https://developer.mozilla.org/en-US/docs/Learn/Server-side/Django/Deployment | https://youtube.com/playlist?list=PLVBKjEIdL9bvCdI4l1Emvbezv10GjUaLk&si=BmBhBA29yvnmyYyU |

8. Remedial Classes

After every Continuous Evaluation, different types of learners will be identified and special discussions will be planned and scheduled accordingly.

Action Plan for different types of learners:

| Learner Type-I | Learner Type- II | Learner Type- III |
|--|-------------------------|------------------------------|
| Remedial Classes, Doubt Sessions, Guided Tutorials | Workshop, Doubt Session | Coding Competitions, Project |

9. Self-Learning

Assignments to promote self-learning and encourage the survey of content from multiple sources.

| S.No | Topics | CLO | ALM | References/MOOCs |
|------|--|--------------|---|---|
| 1 | HTML, CSS, and Javascript | CLO01- CLO05 | Leading Question, Test Questions | Coursera- HTML, CSS, and Javascript for Web Developers https://www.coursera.org/learn/html-css-javascript-for-web-developers |
| 2 | More on styling, Responsive Design, Animations and 3D space, Understanding Document Object Model | CLO02- CLO06 | Leading Question, Test Questions, Brainstorming | Coursera- Responsive Website Development and Design Specialization https://www.coursera.org/specializations/website-development |

10. Delivery Details of Content Beyond Syllabus

| S.No | Advanced Topics, Additional Reading, Research papers | CLO | POs | ALM | References/MOOCs |
|------|--|-------|-----------------|----------------------------------|--|
| 1 | Introduction to React | CLO06 | PO7, PO10, PO11 | Think Pair Share, Brain Storming | https://legacy.reactjs.org/tutorial/tutorial.html https://www.javatpoint.com/react-introduction |

11. Evaluation Scheme & Components:

| Assessment Type | Evaluation Component | Type of Component ¹ | No. of Assessments | % Weightage of Component | Max. Marks | Mode of Assessment | CLO |
|-----------------|----------------------|--------------------------------|--------------------|--------------------------|------------|--|--------------|
| Formative | Component 1 | Continuous Evaluation 1* | 01 | 30% | 30 | Viva Voce, PPT Presentation, File work | CLO01- CLO02 |
| Formative | Component 1 | Continuous Evaluation 2* | 01 | 30% | 30 | Viva Voce, PPT Presentation, File work | CLO01- CLO04 |
| Formative | Component 2 | Final Project Evaluation** | 01 | 40% | 40 | Project, Viva Voce, PPT Presentation, Filework | CLO01- CLO06 |
| Total | | | 100% | | | | |

* Continuous Evaluation is mandatory evaluation taken twice in a semester. It includes use-case designing, file work and viva.

**It is mandatory evaluation including project viva, file and use-case/project designing. Further, as per Academic Guidelines minimum 75% attendance is required to become eligible for appearing in the End Semester Examination.

12. Syllabus of the Course:

| Subject: Web Development Framework Using Python | | Course code: 24CAI1105 | |
|---|---|------------------------|-------------|
| S.No. | Topic(s) | No. of Lectures | Weightage % |
| 1 | Introduction to Web Development, Introduction to Python Flask, Templates and Views, Form Handling and Data Storage | 10 | 17% |
| 2 | Advanced Flask Development, User Authentication and Authorization, RESTful APIs with Flask, Building RESTful web services, Creating endpoints for data manipulation, Handling JSON requests and responses | 13 | 22% |
| 3 | Introduction to Django, Models and Databases in Django, Views, Templates, and Forms, Getting Started with Django, Admin Interface and User Authentication | 20 | 33% |
| 4 | Advanced Django Development: Working with Django REST Framework: Building a Full-Featured Web Application, Deployment and Scaling: | 17 | 28% |

13. Academic Integrity Policy:

Education at Chitkara University builds on the principle that excellence requires freedom where Honesty and integrity are its prerequisites. Academic honesty in the advancement of knowledge requires that all students and Faculty respect the integrity of one another's work and recognize the importance of acknowledging and safeguarding intellectual property. Any breach of the same will be tantamount to severe academic penalties.

This Document is approved by:

| Designation | Name | Signature |
|-------------------------------|-------------------------|------------------|
| Course Coordinator | Dr. Gagandeep | |
| Head-Academic Delivery | Dr. Kamal Deep Garg | |
| Dean (CSE-AI) | Dr. Sushil Kumar Narang | |
| Date (DD/MM/YYYY) | 09/01/2025 | |