ENUGU STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

HANDBOOK

2023

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CIVIL ENGINEERING DEPARTMENT (CVE)

1.0 INTRODUCTION

The Department of Civil Engineering, Enugu State University of Science and Technology is one of the three Departments founded along with the Faculty of Engineering of Anambra State University of Technology, ASUTECH. ASUTECH which is widely known as the first University of Technology in Nigeria was founded on 30th day of July, 1980 by the then Civilian Government of Anambra State headed by Chief Jim Ifeanyichukwu Nwobodo. As a Department in the premier University of Technology in the country, it embraced the Faculty objective of training high level manpower, which would compete favourably with overseas-trained engineers.

With the high premium placed on morals, coupled with a well-articulated curriculum, the Department over four decades, ensures that the students are found worthy in character and learning after their programme. The industrial training scheme is designed in such a manner that academic staff do visit the industries to monitor the performance of students.

There are several reasons why the Department of Civil Engineering in particular has done so well in producing highly qualified Engineers. One of such reason being the location of the University and because of this, numerous visitations to active construction sites have become an integral part of the training programme. The University draws its teaching staff from the academia. Thus, the industrial training starts from the classroom as many competent Consultants have in the past taken up part time teaching appointments and this has greatly facilitated the transfer of their long-standing experiences to students who will tomorrow be their professional colleagues. Today, the Department of Civil Engineering ranks amongst the outstanding Departments in the University.

1.1 VISION, MISSION STATEMENT AND CORE VALUES

The vision of the Department is to be the foremost department and a center of excellence for teaching, learning and research in Civil Engineering in Nigeria; and one of the best Civil Engineering Departments in the world.

Our Mission is to equip our students with requisite intellectual, technical and professional skills and competencies that would enable them upon graduation make positive and impactful contributions to the development of civil engineering in the academia, in the profession and in engineering construction practice.

We have developed strategies for the accomplishments of our mission. They include:

- ❖ Teaching and training our students to acquire the needed intellectual, technical and professional competencies for the design, development testing and production of civil engineering systems, works, facilities, devices and products that are beneficial to the progress and prosperity of the human civilization.
- ❖ Provision of facilities and aids that enhance teaching, research and human capacity development for both the students and members of staff.
- ❖ Designing our curriculum to ensure strict compliance with the Nigerian Universities Commission (NUC) Benchmark Minimum Academic Standards (BMAS) document, in order to assure the programme exceeds the minimum standards expected by the regulatory authority.
- ❖ Designing our curriculum to ensure strict compliance with the standards set by Council for the Regulation of Engineering in Nigeria (COREN) – the professional regulator.

The core values of the department include:

- ✓ Excellence in teaching, learning and research
- ✓ Fairness to all
- ✓ Self-reliance
- ✓ Ethics and best practices
- ✓ Innovation
- ✓ Entrepreneurship
- ✓ Scientific spirit of enquiry

AREAS OF SPECIALIZATION

The areas of specialization are:

- ➢ Structural Engineering
- ➢ Geotechnical/Soil Engineering
- ➢ Water/Environmental Engineering
- ➢ Highway and Transportation Engineering
- ➢ Construction Project Management

1.2 PHILOSOPHY AND OBJECTIVES OF THE DISCIPLINE

1.2.1 PHILOSOPHY OF THE PROGRAMME

The philosophy of the Civil Engineering undergraduate programme is to equip our students with requisite mental, intellectual, moral, knowledge and skill competencies to ensure their abilities to make significant positive impactful contributions to the national and global technological and engineering development in the fields of design, construction management and research on structures, construction materials, highway and transportation, soil mechanics and foundation engineering.

1.2.2 OBJECTIVES OF THE PROGRAMME

The objectives of the undergraduate engineering programme in the Department of Civil Engineering are:

i. to produce graduates who can demonstrate fundamental understanding and knowledge of the basic physical sciences, mathematics, statistics and engineering concepts and theories by applying them to the description and solutions of problems in all the areas of civil engineering.
ii. to produce graduates who can analyse, formulate and solve problems in the field of civil engineering with the effective use of mathematical and computational tools.
iii. to produce graduates who shall be motivated for continuous self-learning practice and pursue research in the advanced and emerging areas of civil engineering in order to offer professional engineering services.
iv. to produce competent young and dynamic civil engineers who are ready to contribute effectively to the advancement of civil engineering and to pursue post graduate studies in universities inside and outside the shores of Nigeria.
v. to produce graduates who can be competent civil engineers in multi-disciplinary infrastructure development projects.

vi. to provide excellent teaching and design experiences that prepare its graduates both for professional practice in all the fields of civil engineering and for the pursuit of lifelong professional development.
vii. to identify, assess, and impart essential knowledge, tools and skills needed for the graduates to become successful civil engineers and lifelong learners.
viii. to recruit highly qualified and diverse students.
ix. to continually strive to improve students' performance and graduation rates.
x. to encourage graduates to achieve professional certification and excellence.
xi. to enhance its nationally and internationally recognized research programs.
xii. to recognize and pursue opportunities for significant contributions in basic and applied engineering research.
xiii. to provide meaningful research experience for students.
xiv. to communicate the research accomplishments of the department staff and students through scholarly research publications, educational outreach programs and professional activities.
xv. to foster a spirit of service and leadership among staff and students.
xvi. to instill pride and loyalty in our graduates that will result in a natural desire to support the department through service and endowments.

1.2.3 PROGRAMME SPECIFIC OUTCOMES

Graduates of the civil engineering programme will be able to plan, analyse, design, estimate bills and costs, supervise and manage the development of residential, commercial, industrial, and infrastructure projects.

They will be able to work in construction sites supervising and managing the construction of various civil engineering projects like highway and transportation, bridges, water treatment facilities, waste disposal facilities, waste conversion facilities, buildings etc.

Graduates will be able to use different software related to civil engineering for developing skills required by the industry.

1.2.4 DEPARTMENT OUTCOMES

i. Graduates of the programme will be actively engaged in professional practice as civil engineers or they would pursue post graduate studies to be in the academia.

ii. Graduates of the programme will understand professional practice issues and demonstrate commitment to professional certifications by the relevant professional bodies like Nigerian Society of Engineers (NSE), Council for the Regulation of Engineers in Nigeria (COREN), Nigerian Institution of Civil Engineers (NICE), Nigerian Institute of Structural Engineers (NIstruct.E) and their foreign counterparts.

iii. Graduates of the programme, guided by the principles of sustainable development will understand how civil engineering projects affect the environment, society, and the nation.

iv. Graduates of the programme will understand the need for life long learning, and conform to the requirements and demands of professional ethics, and codes of professional practice.

The Civil Engineering Department believes that a firm grasp of theories of the basic sciences and the theories of engineering and practical exposure to real-life engineering problems are necessary for the production of confident professionals, that will contribute to the technological advancement of this country and the world at large.

In keeping with this philosophy, after the basic sciences in the first year of study, the department introduces as the first engineering foundation, the study of Theoretical and Applied Mechanics, in the second year. The second year students, who take Faculty-wide courses mounted by every department in the Faculty, are taught courses in Applied Mechanics and Strength of Materials by Civil Engineering Department.

Three semesters of academic work in the third and fourth years and part of the final year's work are devoted to the core and compulsory courses in all the branches of the civil Engineering profession. The second semester of the fourth year (6 months period required) and an earlier three months during the long vacation preceding the fourth year are devoted to supervised attachment to practicing Civil Engineering in engineering design/consulting offices

and construction sites. The remainder of the final year is devoted to a few elective courses that afford minimal specialization and two major supervised project work. One of the projects is a full design project while the other project is a research project.

Furthermore, entrepreneurial courses have also been included in the curriculum and is covered in the second and third year courses on Entrepreneurship study. This is geared towards making the students able to design and develop new products and learn some production techniques in industries, which can help them to become self-employed, and even employers of labour.

The general philosophy therefore is to produce graduates with high academic standard and adequate practical background for self-employment as well as being of immediate value to industry and the community in general.

1.2.5 DEPARTMENTAL OBJECTIVES

The department desires to train Engineers who will immediately upon graduation become useful as problem solvers, designers or product Engineers able to participate actively in the engineering design or construction process, and to translate their knowledge into practical and meaningful products.

Of course, such a high objective demands from the student a thorough knowledge of the basic sciences and mathematics that form the foundation on which engineering principles are built. Also evident is the practical attitude on the part of the student to relate his studies to actual and practical situations. This has made the world a global community. These flow from the general objectives of the University and Faculty of Engineering as stated below.

With engineering, in the forefront, the founding fathers of ESUT conceived a unique technology based university that must relate closely with the society, its industries and above all, serve as a catalyst in the technological advancement of the people. The following objectives were therefore set for the University in general, the Faculty of Engineering and the Department.

- ✓ To encourage the advancement of all branches of learning and to hold out to all persons without discrimination of race, creed, sex or political conviction an opportunity of acquiring higher education.
- ✓ To develop and offer academic and professional programmes leading to the award of degrees, diplomas, certificates and other distinctions, and to award the degrees, diplomas, certificates and distinctions to persons who attain the standard prescribed by the University and have in all other respects satisfied the conditions and requirements laid down or otherwise approved by the University.
- ✓ To encourage and promote scholarship and to conduct research in Scientific, Technological, Professional and other aspects of life.
- ✓ To relate its activities to the technological, cultural, social and economic needs of the people of Nigeria.
- ✓ To undertake any other activities appropriate to a university of the highest standard and such other activities as the University may decide in the furtherance of advancement of learning, particularly in sciences, engineering and technology.
- ✓ To promote research and development directed towards the production of goods and the improvement of technological services.
- ✓ To disseminate scientific and technological knowledge among scientists, researchers, industries, and other bodies which may benefit from such knowledge.
- ✓ To promote the growth and development of scientific and technological applications in the national economy through association with outside persons or bodies and through centers specially set up by the University in that behalf.
- ✓ To ensure that all subjects taught are oriented towards the immediate and long terms needs of the country and that such subjects are also relevant to the needs of the Nigerian economy.
- ✓ To orient technological development to the industrial needs of the country, and

- ✓ To establish industrial centres in order to promote the acquisition of industrial expertise and the exchange of skills between the University and industry.

The objectives of all courses are that, upon completion, the students should have developed:

1. The ability to gather, organize and critically evaluate information needed to formulate and solve problems.
2. A thorough understanding of the subject area which is aligned with the current requirements of the professional institutions.
3. The ability to apply acquired knowledge effectively and efficiently to all work in the relevant areas of Engineering.
4. Skill in oral and written communications appropriate for the presentation of technical information at seminars and conferences.
5. Abilities in observation, management and the design and conduct of experiments through practical experience in the laboratory.
6. The ability to work independently on technical problems, demonstrated in a major item of individual work as well as collaborative works.
7. To design and implement components, structures, and systems.
8. To design and develop new products and production techniques in industries.
9. To install and maintain complex civil, wastewater, water resources engineering systems so that they can perform optimally in our environment.
10. To adapt and adopt exogenous technology in order to solve local civil engineering problems.
11. To be able to exercise original thought, have good professional judgement and be able to take responsibility for the direction of important tasks.
12. To be able to manage people, funds, materials and equipment.
13. To improve on indigenous technology to enhance local problems solving capability.

1.2.6 SUMMARY OF OBJECTIVES

The civil engineering programme objectives are abridged as follows:

- ✓ To produce civil engineering graduates who can think creatively, originally and imaginatively, and know how to apply engineering science and knowledge to the development of civil engineering infrastructures beneficial to societal progress.
- ✓ To produce knowledgeable civil engineering graduates who are immediately employable in the existing and emerging positions in any civil engineering enterprise within and outside the country.
- ✓ To produce intellectually equipped civil engineering graduates who can successfully accomplish advanced/postgraduate studies and research in any specialization of civil engineering anywhere in the world.

2.0 STUDENTS

In order to align students of Civil Engineering with the vision and mission of Enugu State University of Science and Technology (ESUT), it is essential to focus on their holistic development and instill in them the core values and competencies necessary to fulfill the university's goals. Here are some ways of aligning students with the vision and mission of ESUT:

Academic Excellence: Encourage students to strive for academic excellence by maintaining high standards of learning and achieving their fullest potential. Provide a rigorous and well-rounded curriculum that challenges students intellectually and fosters critical thinking, problem-solving, and analytical skills.

Ethical Conduct: Emphasize the importance of ethical conduct in civil engineering practice. Instill in students a strong sense of integrity, professionalism, and social responsibility. Encourage them to adhere to ethical codes, respect diversity, and consider the environmental and societal impacts of their work.

Leadership Development: Foster leadership qualities in students by providing opportunities for them to take on leadership roles within the civil engineering program and student organizations. Promote teamwork, effective communication, and decision-making skills to prepare students for leadership positions in their future careers.

Practical Experience: Provide students with practical experience through internships, co-op programs, and industry collaborations. Enable them to apply their theoretical knowledge in real-world civil engineering projects, fostering a deeper understanding of the profession and developing practical skills.

Entrepreneurial Mindset: Cultivate an entrepreneurial mindset among students, encouraging them to identify opportunities, think innovatively, and develop sustainable solutions. Provide resources and support for entrepreneurial activities and startup initiatives related to civil engineering.

Professional Development: Offer opportunities for students to engage in professional development activities, such as attending conferences, workshops, and seminars. Encourage participation in professional organizations and provide guidance on obtaining professional certifications and licensure.

Community Engagement: Encourage students to actively engage with the community by participating in outreach programs, volunteering for social causes, and contributing their engineering skills for the betterment of society. Instill a sense of service and responsibility towards the community.

Research and Innovation: Promote a culture of research and innovation among students. Encourage them to engage in research projects, present their findings at conferences, and publish papers. Foster an environment that nurtures curiosity, creativity, and problem-solving skills.

Global Awareness: Develop students' global perspective by exposing them to international engineering practices, cultural diversity, and global challenges. Encourage participation in study abroad programs, international collaborations, and exchange programs to broaden their horizons.

Lifelong Learning: Foster a commitment to lifelong learning among students. Promote self-directed learning, continuous professional development, and an enthusiasm for staying updated with emerging technologies and advancements in civil engineering.

Alumni Network: Facilitate strong connections between students and alumni, providing opportunities for mentorship, networking, and guidance. Involve alumni in sharing their experiences and industry insights with students, strengthening the bond between past and present students.

Personal Growth and Well-being: Support the personal growth and well-being of students by offering counseling services, mentorship programs, and extracurricular activities. Encourage a healthy work-life balance and promote mental and physical well-being.

By focusing on these aspects, ESUT can ensure that students of Civil Engineering embody the vision and mission of the university. They will graduate as competent, ethical, and socially responsible civil engineers ready to contribute to the development of Enugu State and beyond.

Requirements and process for admission of students:

The requirements and process for admission to a civil engineering program can vary depending on the specific institution and country. Some aspects of the admission process are as follows;

Educational Requirements: Applicants are typically required to have completed their secondary education or an equivalent qualification. They should have a strong academic background in science and mathematics, including subjects like physics, chemistry, and calculus.
Prerequisite Courses: Some civil engineering programs may have specific prerequisite courses that applicants must have completed at the secondary education level. These prerequisite courses may include subjects like mathematics, physics, and chemistry.
Entrance Examinations: Many civil engineering programs require applicants to take entrance examinations. These exams assess the applicants' knowledge and aptitude in subjects such as mathematics, physics, and engineering-related concepts. The specific entrance examination may vary depending on the institution and country.

2.1 ADMISSION REQUIREMENTS

Admission into the department is through University Matriculation Examination (UME) and Direct Entry. The basic qualification for admission of students through UME is O'Level Credit obtained in not more than two sittings in at least five subjects. The O'Level subjects must include English, Mathematics, Physics and Chemistry, and any other science subject. For direct entry admission, a candidate must (alongside the O'Level requirements) have at least a National Diploma (ND) or Higher National Diploma (HND) Certificates with at least 3.5 (under a 5-point rating) CGPA in a relevant field, or A'Level Credit in Mathematics, Physics and Chemistry, this

will make a candidate eligible for consideration for admission into 200 and 300 levels respectively.

Application Process: Applicants are usually required to submit an application form, along with supporting documents such as academic transcripts, recommendation letters, and a statement of purpose or personal essay. The application form collects information about the applicant's educational background, extracurricular activities, and any relevant work experience.
Interviews: In some cases, institutions may conduct interviews as part of the admission process. Interviews provide an opportunity for the admissions committee to assess the applicant's motivation, communication skills, and suitability for the program.
Selection and Admission: Once all applications have been reviewed, the admissions committee evaluates the applicants based on their academic achievements, test scores, personal statements, and other relevant criteria. The committee then selects the most qualified candidates for admission to the civil engineering program.

It's important to note that the specific requirements and process can vary significantly between institutions and countries. Therefore, it's advisable for prospective students to carefully review the admission guidelines provided by the specific institution they are interested in and follow the instructions provided.

Policies and processes for student transfer and credit transfer/exemption:

Policies and processes for student transfer and credit transfer/exemption may vary between institutions. Some aspects of these processes include;

Transfer Policies: Institutions generally have specific policies regarding student transfers. These policies outline the eligibility criteria, procedures, and requirements for transferring into the civil engineering program. Transfer policies may vary based on factors such as the student's previous academic performance, the accreditation of the previous institution, available spaces in the program, and alignment of courses or curriculum.
Application Process: Students who wish to transfer into a civil engineering program typically need to submit an application to the institution. The application may require providing academic transcripts, course descriptions, syllabi, and other relevant documents from the previous

institution. The application process may also involve submitting a personal statement or essay explaining the reasons for the transfer and the student's academic goals.

Evaluation of Credits: When a student transfers into a civil engineering program, the institution evaluates the credits earned at the previous institution. This evaluation determines which credits can be transferred and count towards the requirements of the civil engineering program. The institution's academic department or registrar's office typically assesses the course content, comparability, and relevance to the curriculum of the civil engineering program.

Credit Transfer/Exemption: Once the credits are evaluated, the institution determines which courses the student is exempt from or receives credit for. Exemption means that the student is not required to take certain courses due to the similarity of the content covered in the previous institution. Credit transfer means that the credits earned at the previous institution are recognized and count towards the completion of the civil engineering program.

Credit Transfer Limits and Conditions: Institutions may have specific limits on the number of credits that can be transferred or conditions that need to be met for credit transfer/exemption. These limits and conditions ensure that students still complete a significant portion of their civil engineering program at the institution offering the program. The limits and conditions may vary depending on factors such as the accreditation requirements, specific program regulations, and institutional policies.

It is important for students considering transfer or credit transfer/exemption to consult with the academic advisors or the registrar's office of the institution they wish to transfer to. These offices can provide detailed information about the specific policies, procedures, and requirements for transfer and credit transfer/exemption in the civil engineering program.

Mechanism for providing guidance to students on academic, career and aspects pertaining to wellness:

To provide guidance to students of civil engineering on academic, career, and wellness aspects, the following mechanisms adopted;

Academic Guidance: a. Academic Advisors: Assign academic advisors to students who can provide guidance on course selection, curriculum planning, and academic progress. b. Study Groups: Encourage students to form study groups to collaborate, share knowledge, and support each other in academics. c. Workshops and Seminars: Organize workshops and seminars on specific subjects or study skills to enhance academic performance. d. Online Resources: Provide

access to online resources such as e-books, research papers, and educational websites to support learning.
Career Guidance: a. Career Counseling: Offer career counseling services to students, helping them explore various career paths in civil engineering and related fields. b. Internships and Co-op Programs: Facilitate opportunities for students to gain practical experience through internships or cooperative education programs, enabling them to apply classroom knowledge in real-world settings. c. Networking Events: Organize networking events where students can connect with industry professionals, alumni, and potential employers. d. Resume and Interview Workshops: Conduct workshops on resume writing, interview skills, and job search strategies to prepare students for the job market. e. Alumni Mentoring: Establish a mentorship program that connects current students with successful alumni who can provide guidance and advice.
Wellness Support: a. Counseling Services: Offer counseling services to address mental health concerns, stress management, and overall well-being. b. Wellness Workshops: Conduct workshops on time management, stress reduction techniques, and maintaining a healthy work-life balance. c. Physical Activities: Promote physical activities and sports programs to encourage students to stay active and maintain a healthy lifestyle. d. Peer Support Groups: Create peer support groups where students can share their challenges, seek advice, and provide emotional support to each other. e. Access to Resources: Provide information on campus resources like health clinics, counseling centers, and wellness programs available to students.

It is important to create a comprehensive support system that integrates academic, career, and wellness aspects to cater to the holistic development of students. Regular feedback mechanisms and evaluations can also help assess the effectiveness of these guidance mechanisms and make necessary improvements.

Students' work load, class size for theory as well as labouratory sessions and completion of courses:

The workload, class size, and completion of courses in civil engineering programs can vary depending on the university or institution. However, some general information on these aspects include;

1. Workload:
   a. **Theory Classes:** Civil engineering programs typically involve a combination of lectures, tutorials, and self-study. The workload for theory classes can vary but generally

requires students to spend several hours each week attending lectures, reviewing study materials, and completing assignments.

b. **Laboratory Sessions:** Civil engineering programs often include laboratory sessions where students gain hands-on experience with equipment, experiments, and data analysis. These sessions may require additional preparation and post-lab work, adding to the overall workload.

c. **Projects and Assignments:** Students are often assigned individual or group projects and assignments that require research, analysis, and design work. These tasks can significantly contribute to the workload and may involve meeting deadlines.

2. Class Size:

   a. **Theory Classes:** The class size for theory-based civil engineering courses can vary depending on the university and the specific course. It can range from smaller classes with around 20-30 students to larger lecture halls accommodating 100 or more students.

   b. **Laboratory Sessions:** Laboratory sessions generally have smaller class sizes to ensure effective supervision and hands-on learning. The class size for laboratory sessions can vary but is typically smaller than theory classes to facilitate individual attention and practical training.

3. Completion of Courses:

   a. **Duration:** Civil engineering programs usually span four years for a bachelor's degree. During this time, students are required to complete a set number of credit hours and specific courses as per the curriculum.

   b. **Prerequisites:** Some courses in civil engineering may have prerequisites, meaning students must successfully complete certain prerequisite courses before enrolling in advanced or specialized subjects.

   c. **Electives and Concentrations:** In addition to core courses, students often have the flexibility to choose electives or concentrations in specific areas of civil engineering, allowing them to tailor their education according to their interests and career goals.

   d. **Graduation Requirements:** To complete their civil engineering degree, students must fulfill all the required courses, attain the necessary credit hours, and meet any other graduation requirements set by the university or institution.

It's important to note that the specific workload, class sizes, and course completion requirements can vary between different universities or civil engineering programs. It's advisable to refer to

the specific curriculum and policies of the institution you are interested in for more accurate and detailed information.

Formal or informal feedback platform/channel to obtain students feedback and suggestions for further programme improvement and how has the feedback resulted in programme improvement:

To obtain students' feedback and suggestions for further program improvement, universities and institutions can establish formal and informal feedback platforms/channels. Here are some common methods used:

1. Formal Feedback Platforms:
   a. **Surveys:** Conduct anonymous surveys at the end of each semester or academic year, specifically designed to gather feedback on various aspects of the program such as curriculum, teaching quality, resources, and support services.
   b. **Focus Groups:** Organize focus groups consisting of students from different cohorts to discuss their experiences, challenges, and suggestions regarding the program. These group discussions can provide more in-depth insights.
   c. **Student Representatives:** Appoint student representatives who can act as liaisons between the student body and the program administrators. They can collect feedback from their peers and present it during meetings with faculty and administrators.
   d. **Exit Interviews:** Conduct exit interviews with graduating students to gather their feedback on the overall program, areas for improvement, and suggestions for future enhancements.
2. Informal Feedback Channels:
   a. **Open Forums:** Organize open forums or town hall-style meetings where students can freely express their opinions, concerns, and suggestions regarding the program. This informal setting encourages open dialogue.
   b. **Online Feedback Forms:** Set up online feedback forms or suggestion boxes where students can submit their feedback anonymously. This provides an easy and convenient way for students to share their thoughts.
   c. **Faculty**-Student Interactions: Encourage faculty members to have regular interactions with students, both inside and outside the classroom. These informal discussions can help faculty gauge students' perspectives and identify areas for improvement.

Program improvement resulting from feedback can be seen in various ways, such as:

Curriculum Enhancement: Feedback from students can highlight areas where the curriculum can be improved, such as updating course content, adding new courses to meet industry demands, or revising the sequence of courses to enhance learning progression.

Teaching and Learning Methods: Feedback can lead to improvements in teaching methodologies, instructional materials, and assessment strategies. For example, if students express the need for more practical applications or hands-on experiences, faculty can incorporate more project-based learning or case studies into the curriculum.

Resource Allocation: Feedback can inform decisions related to resource allocation. For instance, if students consistently express the need for additional laboratory equipment or updated software, the program administrators can consider investing in those resources.

Support Services: Students' feedback can shed light on areas where support services can be enhanced. This can lead to improvements in academic advising, career counseling, wellness support, and other student services.

Institutions should establish a feedback loop to communicate the actions taken in response to student feedback. This helps build transparency and trust between students and program administrators. It also demonstrates that their feedback is valued and contributes to ongoing program improvement.

Graduation requirements for civil engineering programme:

The specific graduation requirements for a civil engineering program can vary between universities and institutions. However, here are some common elements included in the graduation requirements:

Credit Hours: Students are required to earn a specified number of credit hours to fulfill the program's graduation requirements. The exact number of credit hours can vary but is usually in the range of 120 to 140 credit hours for a bachelor's degree program.

Core Coursework: Civil engineering programs have a set of core courses that all students are required to complete. These courses provide a foundation in fundamental engineering principles and cover essential areas of civil engineering, including structural analysis and design, transportation engineering, geotechnical engineering, environmental engineering, and water resources engineering.

Technical Electives: Students often have the flexibility to choose technical elective courses within civil engineering or related disciplines. These elective courses allow students to specialize in specific areas of civil engineering based on their interests and career goals.
General Education Requirements: Many civil engineering programs include general education requirements that cover a range of subjects outside the engineering field. These requirements typically include courses in mathematics, natural sciences, humanities, social sciences, and communication skills.
Senior Design Project: As a culmination of their studies, civil engineering programs often require students to complete a capstone project or a senior design project. This project typically involves applying engineering principles to solve a real-world problem, working in teams under the guidance of faculty.
Minimum Grade Point Average (GPA): Students are usually required to maintain a minimum GPA to be eligible for graduation. The specific GPA requirement can vary between institutions, but it is typically around 2.0 or higher on a 4.0 scale.
Professional Development: Some civil engineering programs may require students to participate in professional development activities, such as attending engineering conferences, completing internships or cooperative education experiences, or engaging in community service projects.

It's important to note that these graduation requirements are general guidelines and can vary depending on the specific university or institution. Students should refer to their institution's official academic catalog or consult with their academic advisors to obtain accurate and up-to-date information about the graduation requirements for their civil engineering program.

CQI strategies to be implemented in relation to students:

Continuous Quality Improvement (CQI) strategies can be implemented in relation to students of civil engineering to enhance the learning experience, improve program outcomes, and meet the evolving needs of the industry. Here are some CQI strategies that are being implemented:

1. Regular Feedback and Evaluation:
   a. Course Evaluations: Conduct periodic evaluations of courses to gather feedback from students regarding the effectiveness of the curriculum, teaching methods, and learning resources.

b. Program Reviews: Conduct comprehensive reviews of the civil engineering program, involving faculty, industry professionals, and student representatives. The feedback obtained can help identify areas for improvement and inform program enhancements.

c. Alumni Surveys: Reach out to program alumni to gather feedback on the relevance of the curriculum, the preparedness for their careers, and suggestions for program improvements.

2. Curriculum Review and Enhancement:

   a. Industry Alignment: Establish strong connections with industry professionals and organizations to ensure the curriculum is aligned with the latest industry trends and demands. Regularly review and update the curriculum to incorporate new technologies, emerging practices, and relevant case studies.

   b. Integration of Practical Learning: Emphasize hands-on experiences, practical exercises, and real-world projects within the curriculum. Engage students in design projects, internships, and cooperative education opportunities to bridge the gap between theory and practice.

   c. Flexible Electives: Offer a range of elective courses that allow students to specialize in their areas of interest within civil engineering. Continuously evaluate the relevance and demand of elective courses to ensure they align with industry needs.

3. Faculty Development and Support:

   a. Professional Development Opportunities: Provide opportunities for faculty to engage in professional development activities such as attending conferences, workshops, and seminars. Encourage faculty to stay updated on advancements in civil engineering and teaching methodologies.

   b. Teaching Effectiveness: Implement mechanisms to evaluate and improve teaching effectiveness. Encourage faculty to use innovative teaching methods, technology-enabled learning, and active learning strategies to enhance student engagement and learning outcomes.

   c. Mentorship and Collaboration: Foster a culture of mentorship and collaboration among faculty members. Encourage the sharing of best practices, collaboration on research projects, and regular communication to ensure continuous improvement.

4. Student Support Services:

   a. Academic Advising: Provide comprehensive academic advising services to guide students in course selection, curriculum planning, and career pathways. Ensure regular check-ins with advisors to address student concerns and provide guidance.

b. Student Engagement: Foster a supportive and inclusive learning environment by organizing student clubs, professional societies, and extracurricular activities related to civil engineering. Encourage student involvement in research, conferences, and competitions.

c. Counseling and Wellness Support: Offer counseling services and wellness programs to address the mental health and well-being of students. Provide resources and support systems to help students manage stress, develop effective study habits, and maintain a healthy work-life balance.

5. Data Collection and Analysis:

a. Learning Analytics: Utilize learning analytics tools to collect and analyze data on student performance, engagement, and progression. Identify patterns and trends to proactively address student challenges and tailor interventions.

b. Alumni Tracking: Establish a system to track the career progression and achievements of program alumni. Collect data on their success in the workforce, the skills gained from the program, and their feedback on the program's strengths and areas for improvement.

Implementing these CQI strategies fosters a culture of continuous improvement and ensures that the civil engineering program remains relevant, rigorous, and responsive to the needs of students and the industry. Regular assessment, feedback, and collaboration among stakeholders are essential for effective implementation and sustained success.

GUIDELINE FOR STUDENTS

Important information to note for progress through the degree programme:

- Every student is assigned an academic adviser who guides him/her throughout his/her studies in the University.
- A student admitted into the University for the first time to study for a degree (including transfer students), will be required to matriculate and then sign the matriculation register.
- Proper and timely registration is very important under the course unit system. This is so because the programmes of the students are somewhat individualized under the course

unit system. Students who attempt examinations in courses for which they have not registered will obtain no results in the courses.

2.2 STUDENT'S ACADEMIC ADVISING

Students are assigned Academic Advisers from among the Academic staff with whom they consult on regular basis for advice.

Advising and Academic Support: Throughout the transfer and credit transfer/exemption process, institutions typically provide advising and academic support to assist students. Academic advisors or counselors guide students through the requirements, help with course selection, and ensure a smooth transition into the civil engineering program. They may also assist in resolving any issues related to credit transfer or exemption.

Our current Distribution is as follows

Year of Study	**Academic Adviser**
Year 5	Engr. Dr. Mrs. C.S. Anijiofor-Ike
Year 4	Engr. Dr. D.C. Ugwuanyi
Year 3	Engr. S.N. Ikwueze
Year 2	Engr. Mrs J.N. Ugwu
Year 1	Engr. Dr. C. Odenigbo

2.3 REGISTRATION OF COURSES

Registration begins with payment of the stipulated fees and other charges of the University through the designated banks. On presentation of the teller, the faculty finance officer issues official university receipt for fees paid. Thereafter, registration forms are collected from the departmental offices upon presentation of the official receipts. Any student who by chance sits

for semester examination without paying school fees and other charges will receive no result in the examinations. Request for the release of the result of such students may be considered only after:

- He/she has paid all fees owed to the University.
- He/she has paid late result processing fee approved by the University.
- It is mandatory for all students to register for courses at the beginning of each semester of a session in accordance with the rules made from time to time by the University. Normal registration for courses ends two weeks after the beginning of each semester.
- Registration forms must be carefully and correctly filled out. Cancellation(s), erasure(s), mutilation(s), correction(s) with correction fluid, etc are not allowed on the forms. Academic advisers are to be consulted before filling the registration forms.
- Courses are registered at the beginning of every session. Failed courses are registered first and higher level courses are then added to make up the approved maximum of 24 credit per semester (if the student is advised to carry full load). Late registration may be allowed only on payment of a penalty fee, which varies from time to time according to the University regulations.
- If the time table permits, a third year student may take a lower or higher level course, provided that he/she has the prerequisites for the course.
- A student does not repeat an entire year of study unless his/her cumulative grade point average falls below 1.5. Such student repeats only those courses which he/she failed. Students carrying over courses will not be allowed to register more than 48 Credit per session.
- A student will normally in any academic year be allowed to register for, and take a minimum of 30 Credit and a maximum of 48 Credit. Thus, no student will be credited with more than 48 Credit at the end of each academic year. Without prejudice to the above, a graduating student may register for only the number of Credit he requires to graduate. Students may

be examined by continuous assessment, which form part of the end of course grading, provided that it does not count for more than 30% of the final mark in the course.

2.4 MINIMUM DURATION

The minimum duration of the programme is five academic sessions for candidates who enter with Senior Secondary School Certificate (SSCE) or GCE 'O' Level qualifications. Candidates with relevant passes in Mathematics, Physics and Chemistry at GCE 'A' Level or equivalent will spend a minimum of four academic sessions provided that they satisfy all the other University requirements. Candidates with HND, relevant Bachelor's degree or their equivalent will spend a minimum of three sessions.

2.5 GRADUATION REQUIREMENTS

Degree Classification

The determination of the class of degree is based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme. The CGPA is computed by dividing the total number of credit points (TCP) by the total number of units (TNU) for all the courses taken in the semester. The CGPA is used in the determination of the class of degree as summarized in Table 1 below.

Table 1: Degree Classification

Cumulative Grade Point Average (CGPA)	**Class of Degree**
4.50 – 5.00	First Class Honours
3.50 – 4.49	2nd Class Honours Upper Division
2.40 – 3.49	2nd Class Honours Lower Division

1.50 – 2.39	3rd Class Honours
1.00 – 1.49	Pass
0 – 0.99	Fail

The maximum length of time allowed to obtain a degree in the Faculty is fourteen semesters for 5-year degree programme and twelve semesters for students admitted directly into 200 level. For extension beyond the maximum period, a special permission of Senate shall be required on the recommendation of the Faculty Board.

2.6 REGULATIONS GOVERNING THE COURSE

Unit System

i. ***Title of Degree:*** The faculty provides a 5-year (regular) and 4-year direct entry programme leading to the degree of Bachelor of Engineering (B.Eng) with Honours in the appropriate subject of degree option. Candidates with Higher National Diploma (HND) in the appropriate discipline may be admitted for 3-year programme.

ii. ***Credit and Minimum Credit Load:*** Courses are evaluated in terms of Credit (or units). One credit (unit) means one hour lecture contact in a course per week or two or three hour practical/laboratory/tutorial class per week, or an equivalent amount of study or any combination of these lasting for one semester. Thus, a credit (unit) load is equivalent to 15 lecture hours or 30-45 hours of practical, studio work or tutorials per semester of fifteen weeks.

iii. ***Course Numbering:*** A three digit code is adopted as follows: the first digit denotes the level or year of study. The second digit denotes the subject area (specialist or stress area). The third digit denotes the order in which the courses are given.

iv. ***Core Courses:*** These are courses that must be offered and passed by all students in any undergraduate programme.

v. ***Elective Courses:*** These are courses which can be registered only on the advice of the academic adviser as required courses, and which must be passed by a student so advised in order to graduate.

vi. ***Optional Courses:*** These are courses, which may be taken by a student to make up the minimum Credit required in a semester.

vii. ***Industrial Training (IT):*** Industrial Training lasts for only six months, that is the whole of the second semester of the fourth year of the regular Bachelor of Engineering programme. It is designed to give students an opportunity to put into practice the knowledge that they have acquired in the classroom. It is a prerequisite for graduation.

2.7 ADD AND DROP FORM

The add and drop forms are obtainable at the faculty office to enable students add to the courses within the approved maximum units for a semester and to drop any course within a stipulated time as may be reflected on the University calendar issued at the beginning of every semester.

2.8 CHANGE OF PROGRAMME

Students are allowed to seek change within and outside the faculty. The form for the dispensation is obtained at the Academic Affairs Unit of the registry for a fee and must be completed within a stipulated period of time as may be fixed by the University. Students willing to change programme must satisfy minimum admission requirements of the new programme and must have been duly released by their departments and faculties before they can be accepted in the new departments.

2.9 REQUIREMENTS FOR THE AWARD OF DEGREE

To be eligible for a Bachelor of Engineering degree in any department in the faculty, a student must successfully complete the following:

- University Common Courses
- Intra and Inter Faculty Courses
- Departmental Core Courses
- Six Month Supervised Industrial Training
- An original research project satisfactorily defended

2.10 CODE OF CONDUCT FOR STUDENTS OF THE FACULTY

- Punctual and regular attendance at lectures, tutorials and seminars and practical classes are compulsory.
- A student who has a genuine reason to be absent from any of the activities listed above must first obtain permission from the lecturer(s) or personnel in charge.
- Students must consult with their level advisor or such persons that may be knowledgeable about the operation of the course unit system for necessary information.
- Students must not be involved in any clandestine activities like cultism.
- Students should learn how to compute their semester GPA as well as CGPA and keep accurate records of their academic performance.
- Students should not disturb the peace and order of the faculty through noise making operating musical instruments or drumming.
- Handsets must be switched off during lectures, tutorials, seminars, practical classes, etc.
- Students should shun fighting and any other violent acts.
- Students must treat one another with respect.
- Students should maintain an honest life.

- Students should work hard, recreate and pray.
- Students are advised to dress moderately and decently.

2.11 DEPARTMENT INTERACTION

At the start of the year, you will be assigned a personal lab supervisor, tutor and academic adviser. You should make every effort to keep him/her informed of any issues that may affect your studies. If there are matters which you feel you cannot discuss with your tutor/adviser you may approach any other member of staff in confidence. If you encounter any problems, then please contact the Head of Department.

2.12 DEPARTMENTAL ENGINEERING SOCIETY

The Association of Civil Engineering Students or ACES for short is run solely by CVE Departmental Students.

No previous experience is required for positions of responsibility within the association.

The society mainly concentrates on social aspects of the department by organizing activities that enhances personal growth and fellowship.

Various sports events are arranged throughout the year by the Sports Unit of the University including football league, inter-mural competitions, etc.

In addition to these social activities, we periodically arrange industrial trips and for guest speakers to come and talk to us about topics of interest, with the help and support of the department.

2.13 EXAMINATION

EXAMINATION CONDUCT AND INVIGILATION

- Students shall use their Registration Numbers and not their names during university examinations.
- The University shall supply printed answer booklets for all semester examinations. The booklet used and unused should not be removed from the examination hall by candidates.
- The information required on the cover page of the examination booklet must be clearly and legibly completed by students.
- No student is allowed to bring in any material into the examination hall.
- Except in cases of ill health or accident, no candidate shall be allowed to leave the examination hall within 30 minutes of the commencement of the examinations or to enter the hall after the first 30 minutes.
- There shall normally be not less than two invigilators in one examination room. In large halls a ratio of one invigilator to 50 students shall be maintained.
- Invigilators shall be drawn from academic and other related staff of the University.
- The invigilators shall keep an officially prepared examination attendance list, which all students taking the examination must sign. The invigilators must reconcile the number on the attendance register with the number of scripts submitted.
- Each examination shall have a chief invigilator who shall collect examination materials from the faculty officer 30 – 40 minutes before the examination begins.

Examination malpractices are irregularities or infringements of the regulations during the conduct of an examination. These include but are not limited to students copying from each other, bringing into the examination hall papers, books or other implicating materials, walking about and causing any form of disturbance, not observing the time regulations of the examination, disobeying, insulting or fighting the invigilator(s). The chief invigilator is required to make a written report immediately using the prescribed form, on each case of examination malpractice or irregularity to the Dean of the relevant faculty through his/her HOD. If need be, extra sheets of paper should be used to include details not included in the form but which are

important to the case. The invigilators shall as much as possible control the situation in the examination hall. An on-the spot statement should be obtained from the student by making him/her read and sign the completed form. Where the student refuses to sign the filled form, he/she should be asked to write his/her side of the malpractice story on the spot and submit to the chief invigilator.

The following procedure will be adopted in dealing with examination malpractice

- The chief invigilator concerned shall through his HOD submit three copies of the completed exam malpractice form together with other reports (if any) and necessary attachment to the Dean of the faculty offering the course within two working days of the incident. The HOD keeps one set of the documents and forwards two sets to the Dean.
- The Dean shall refer the matter to the relevant examination committee through the examination officer of the registry by forwarding one set of the documents to examination office. The Dean retains one set of the documents in his/her office.
- The relevant examination committee shall invite the student(s) to appear before it and clear him/herself of the allegations.
- The Dean of Faculty through the Head of Department shall inform the concerned student(s) at the time the report was made to the committee and before their departure for vacation that they have cases to answer so that they will be available at the time the committee will sit to deliberate on the allegations.
- The relevant examination committee shall commence investigation within one week of the exams. The committee may obtain written or oral evidence from witness, the invigilator(s), the student concerned and any others, if necessary. Thereafter, the committee shall submit its findings and recommendations to Senate for a final action.
- Any student found guilty of examination malpractice may be subjected to any of the following, depending on the gravity of the offence(s) committed and any appropriate recommendation of the committee.

i. The student may be issued with a warning.
ii. The student may fail the examination.
iii. The student may be sent down for one semester, one year, etc as the case may be.
iv. The student may be expelled.
v. Any other appropriate punishment as prescribed by the committee in line with approved sanctions.

- Any other person who observes any examination malpractice or irregularity shall be free to file a report to the exams office of the registry.

CATEGORIZATION OF EXAMINATION IRREGULARITIES AND ACCOMPANYING PUNISHMENT AS APPROVED BY SENATE

Examination Offences Committed by Students

The various examination offences committed by students are categorized as follows:

1. Offences punishable by expulsion from the University.
2. Offences punishable by suspension for one year or more.
3. Offences punishable by issuing a student with a written warning.

The following sanctions are recommended as appropriate for the various examination offences which are very common among students.

Punishment for Examination Offences Committed by Students

Group A: *Offences punishable by expulsion from the University*

i. Assault on the invigilator.
ii. Impersonation – when the impersonator is not a student of ESUT, he/she should be handed over to the police and if he/she is from another tertiary institution and his particulars are known, he should be reported to his institution.

iii. Involvement in alteration of grades.

iv. Being in possession of any dangerous weapon in and around examination venue. (In addition, the student should be handed over to the police).

Group B: ***Offences punishable by three (3) years suspension***

i. Involvement in examination leakage.

ii. Destruction of evidence relevant to the case.

iii. Smuggling already prepared answer script into the examination hall.

Group C: ***Offences punishable by three (3) years suspension for the second offender and two (2) years for the first offender***

i. Being in possession of materials relevant to the examination.

ii. Refusal to surrender exhibit in connection with the examination offence.

iii. Snatching of answer script from another student.

iv. Writing solutions on any part of the body or clothes.

v. Use of calculators and phones to store solutions relevant to the solutions.

Group D: ***Offences punishable by three (3) years suspension for the second offender and one (1) year for the first offender***

i. Smuggling out answer scripts from exam hall.

ii. Smuggling out examination questions from the exam hall.

iii. Exchange of answer scripts during an examination for the partners.

iv. Failure/Refusal to submit answer script after examination.

Group E: ***Offences punishable by one (1) year suspension for the second offender and being made to fail examination for the first offender***

i. Writing solutions on any part of the question paper.

ii. Exchanging question papers with solutions written on any part of them.

iii. Cheating by peeping into another person's work during examination.

iv. Displaying one's work for another to copy from.

v. Talking to, or with another student during examination.

vi. Disobeying the invigilator during an examination; e.g. refusal to relocate, refusal to stop writing, refusal to sign in and out, undue delay in submitting answer script at the end of the examination.

vii. Creating disturbance during the examination, e.g. shouting slogan, shuffling feet unduly, whistling, fighting (both partners), assaulting another student, causing panic, etc.

viii. Unjustified verbal attack on the invigilator.

ASSESSMENT

What are the examiners looking for?

The examiners will be looking for evidence of "knowledge", "skill", "understanding" and "creativity".

Knowledge: The factual information imparted in the course.

Skill: The ability to execute relevant analytical procedures so that knowledge can be used.

Understanding: The ability to use the knowledge, skill and understanding in situations which are beyond those covered directly in the course.

Creativity: The ability to use the knowledge, skill and understanding in situations which are beyond those covered directly in the course.

Tips to examination to enable students go through

1. All candidates should read carefully the University's Examination Regulations and these notes.
2. **Fee:** No student will be allowed into an examination hall when he/she owes fees and the examination fee must be paid and the ICT Exam number obtained.
3. **Timetables:** For invigilated examinations draft and final timetables will be available. Students are asked to check that all their papers appear on the draft. If there are any clashes or missing papers, students should contact the department timetable officer. The examination halls in which papers are being held will be included on the final timetable.
4. **Smoking and consumption of alcoholic drinks** is not allowed in the examination halls.
5. **Admission to the Hall:** Candidates will be admitted to the hall a few minutes before the start of each examination.
6. **Absence:** If, for no good reason, a student fails to attend an examination, no special papers will be set and the student shall be deemed to have failed.
7. **Late arrival and early departure:** Candidates who are more than 30 minutes late for an examination may not be admitted. A candidate will not be allowed to withdraw from an examination until 40 minutes have elapsed. Any candidate leaving an examination must do so quietly and take care not to disturb other candidates. No candidate will be allowed to leave during the last ten minutes of an examination.
8. **During the few minutes before the examination begins:**

   Candidate must:

   (a) Listen carefully to any announcements the Chief Invigilator may have to make.

   (b) Make sure that they have correct question paper on their desks: if in doubt they should put up a hand and ask an invigilator.

(c) Complete the attendance slip on the desk, (this will be collected by an invigilator soon after the start of the examination). This may be in addition to thermometric identification.

(d) Complete as far as possible the cover sheet of one answer book on the desk.

(e) Read the notes on the cover of the answer book.

If candidates require further stationery during the examination, they should put up a hand and an invigilator will bring it to them.

Temporary withdraw: A candidate who wishes to make a temporary withdraw from an examination for personal reasons must put up a hand and ask to be accompanied by an invigilator or other authorized person.

Illness during an examination: A candidate who wishes to withdraw from an examination because of illness should inform an invigilator. The candidate may be escorted to the University Health Service, or other.

If a candidate withdraws temporarily by illness but is able to continue the examination after a short absence, the period of time lost through illness will be noted and the information taken into consideration where appropriate.

At the end of an examination all answer books, continuation sheets (even if only used for rough notes) and graph paper should be fastened together with string. If more than one book is used, all relevant papers should be fastened in their appropriate book. All cover sheets of used answer books must be completed and candidates must enter in the space provided the numbers of the questions answered within, in the order in which they have been attempted. Candidates must leave the hall quickly and quietly when permitted to do so, leaving all written work on the desk. Question papers may be removed from the hall only if no instruction to the contrary is given.

3.0 Programme Educational Objectives PEOs

Program Educational Objectives (PEOs) for Civil Engineering at Enugu State University of Science and Technology (ESUT) should align with the university's vision and mission while considering the specific goals of the civil engineering program.

The vision and mission of Enugu State University of Science and Technology (ESUT) are as follows:

Vision: To be a world-class institution for research, innovation, and technological advancement, providing high-quality education and producing graduates who are globally competitive.

Mission:

- To provide excellent education and training in science, technology, and related disciplines, fostering intellectual growth and promoting research and innovation.
- To contribute to the socioeconomic development of Enugu State, Nigeria, and the world at large through the application of science, technology, and innovation.
- To cultivate a culture of entrepreneurship and promote collaboration between academia, industry, and the community, fostering the development and transfer of technology and knowledge.
- To develop leaders and professionals who possess the necessary skills, knowledge, and ethical values to address societal challenges and contribute to sustainable development.
- To engage in cutting-edge research and development activities that address local and global challenges, with a focus on areas of strategic importance and relevance to society.
- To provide a conducive and inclusive learning environment that promotes critical thinking, creativity, and lifelong learning, preparing students for successful careers and lifelong learning in a rapidly changing world.
- To promote community engagement and social responsibility, actively participating in the development and improvement of the local community through various outreach programs and initiatives.

Program Educational Objectives (PEOs) are as follows;

Technical Competence: Graduates of the civil engineering program will demonstrate technical proficiency in analyzing, designing, and managing civil engineering systems and infrastructure projects.
Professional Development: Graduates will engage in continuous professional development, keeping up with advancements in the field of civil engineering and pursuing lifelong learning opportunities.
Ethical and Social Responsibility: Graduates will practice civil engineering with a strong sense of ethical responsibility, considering the environmental and societal impacts of their designs and decisions.
Leadership and Teamwork: Graduates will possess effective leadership and teamwork skills, enabling them to lead and collaborate in multidisciplinary projects and teams.
Effective Communication: Graduates will be able to communicate effectively, both verbally and in writing, with different stakeholders, including clients, colleagues, and the general public.
Entrepreneurship and Innovation: Graduates will have the ability to identify and pursue entrepreneurial opportunities in the field of civil engineering while fostering innovative and sustainable solutions.
Professional Engagement: Graduates will actively participate in professional organizations and engage in community service, contributing to the advancement of the civil engineering profession and addressing societal needs.
Global Perspective: Graduates will have an understanding of global issues and cultural diversity, enabling them to work effectively in a globalized and multicultural engineering environment.
Lifelong Learning: Graduates will develop a commitment to lifelong learning and professional growth, adapting to emerging technologies, and evolving engineering practices.
Contribution to Sustainable Development: Graduates will contribute to sustainable development by incorporating environmentally friendly and economically viable practices in their civil engineering projects.

How the PEOs are consistent with the with the vision and mission of the University and other stakeholders' requirements:

ESUT's vision and mission statements reflect its commitment to providing quality education in science and technology fields, including civil engineering. For example, if ESUT's mission includes producing competent and skilled graduates who can contribute to societal development,

the civil engineering program's objectives should focus on developing students' technical knowledge and skills to meet industry demands and societal needs.
Stakeholders in civil engineering education may include industry professionals, employers, alumni, accrediting bodies, and the local community. The program's educational objectives should address the needs and expectations of these stakeholders. For instance, stakeholders may emphasize the importance of graduates who are well-prepared to tackle real-world engineering challenges, possess strong teamwork and communication skills, and demonstrate ethical and professional behavior.
Overall, the programme educational objectives for civil engineering should be dynamic, promoting continuous improvement and adaptation to ensure the program remains relevant and effective in preparing graduates for successful careers and societal contributions.

Processes used to evaluate the achievement of PEOs:

Some of the processes used for evaluating the attainment of program educational objectives are as follows;
Employer Feedback: Gathering feedback from employers who have hired graduates from the civil engineering program helps assess how well the educational objectives align with industry needs. Employers can provide insights into the strengths and areas for improvement in the program's graduates, their level of preparedness for the job market, and their ability to contribute effectively to the workplace.
Alumni Tracking: Tracking the career progression and achievements of program graduates over time provides valuable insights into the effectiveness of the educational objectives. This can be done through alumni databases, surveys, or interviews to gather information on their employment status, job responsibilities, and the extent to which their education has contributed to their professional success.
Stakeholder Surveys: Surveys are conducted to gather feedback from various stakeholders, including alumni, employers, and industry professionals. The surveys may focus on assessing the extent to which the program's graduates are meeting the educational objectives and whether they possess the desired knowledge, skills, and attributes.
Student Surveys and Feedback: Obtaining direct feedback from current students is crucial in evaluating the effectiveness of the educational objectives. Surveys, focus groups, and course evaluations can provide insights into students' perceptions of their preparedness, the relevance of the curriculum, and their overall satisfaction with the program.

Program and Course Assessments: Regular assessment of courses and the program itself is essential for evaluating the achievement of educational objectives. This can involve collecting and analyzing student performance data, such as grades, project outcomes, and exam results, to determine if students are meeting the expected learning outcomes associated with the educational objectives.

Continuous Improvement Processes: The evaluation of program educational objectives should be an ongoing process, with a focus on continuous improvement. Based on the assessment data and feedback, program administrators and faculty can identify areas where the educational objectives may need refinement, and make adjustments to the curriculum, teaching methods, or student support mechanisms accordingly.

How the results obtained from evaluation of PEOs are being used to improve the effectiveness of the programme:

Using the results obtained from the evaluation of program educational objectives for civil engineering, several strategies were applied to improve the effectiveness of the civil program;

- By thoroughly analyzing the evaluation results, considering feedback from stakeholders, alumni, employers, and students. Identify patterns, trends, and areas of improvement that emerge from the data. Look for gaps between the desired outcomes and the actual achievements of the program.
- By reviewing the program's curriculum, course content, and learning outcomes in light of the evaluation results. Determine if the educational objectives are aligned with industry needs, technological advancements, and societal demands. Identify any gaps or areas where improvements can be made.
- Based on the evaluation results, revise and update the course content to ensure it aligns with the desired learning outcomes and industry requirements. Incorporate emerging trends and technologies relevant to the civil engineering field. Introduce practical applications, case studies, and real-world projects to enhance the students' hands-on experience.
- By using the evaluation results to improve teaching methods and instructional approaches. Identify areas where students may be struggling or not meeting the educational objectives, and develop strategies to address those challenges. Consider

incorporating active learning techniques, such as problem-based learning, group projects, and industry collaborations, to enhance student engagement and learning outcomes.

- By providing professional development opportunities for staff to stay updated with the latest advancements and best practices in civil engineering education. Encourage participation in conferences, workshops, and training programs to enhance their teaching skills and subject knowledge. Foster a culture of continuous improvement among staff.
- Based on feedback from employers and industry professionals, strengthen partnerships and collaborations with the industry. Engage industry experts as guest lecturers, mentors, or advisors to provide insights into the latest industry practices and help bridge the gap between academia and the profession. Foster internship and cooperative education opportunities to provide students with practical exposure and industry experience.
- By creating a culture of continuous improvement by encouraging open communication, collaboration, and innovation within the civil engineering program. Involve all stakeholders in the improvement process and ensure that their perspectives are valued and incorporated.
- By continuously tracking the career progression and achievements of program graduates. Identify successful alumni who have made significant contributions to the civil engineering field and showcase their accomplishments to inspire current students. Leverage alumni networks to provide mentorship and networking opportunities for current students.

Processes used to evaluate the level of achievement of PEOs:

By employing the following processes and tools, the evaluation of the level of achievement of program educational objectives can be conducted systematically, allowing for informed decision-making and continuous improvement in the program.

Graduate/Alumni Database: Maintain a comprehensive database of program graduates and alumni. This database should include information such as contact details, employment history, positions held, achievements, and contributions to the field. Regularly update the database and track the career progression and accomplishments of alumni.

Meetings: Organize meetings with program faculty, industry professionals, and alumni to discuss the achievement of educational objectives. These meetings can provide a platform for

stakeholders to share their perspectives on how well the objectives are being met and provide feedback on areas of improvement.

Surveys: Conduct surveys to gather feedback from graduates, employers, and other stakeholders. Design the survey questions to specifically address the educational objectives and seek input on the graduates' preparedness, skills, and abilities. Consider using both quantitative and qualitative survey questions to capture a comprehensive understanding of achievement levels.

Interviews: Conduct individual or group interviews with alumni, employers, and industry professionals to delve deeper into their experiences and perceptions regarding the achievement of educational objectives. Interviews can provide valuable qualitative insights and allow for more in-depth discussions.

Activity Frequency and Timelines: Establish a schedule for evaluation activities to ensure regular and timely assessments. Determine the frequency of data collection, such as conducting surveys and updating the alumni database, based on the program's resources and requirements. Set specific timelines to review and analyze the data collected and develop action plans for improvement.

Benchmarking: Compare the program's educational objectives with national or international benchmarks and standards in civil engineering education. This can provide a reference point for evaluating the achievement levels and identifying areas for improvement.

Data Analysis: Analyze the data collected from surveys, interviews, and alumni databases to identify patterns, trends, and areas of strength or weakness. Look for common themes in the feedback received and consider quantitative measures such as graduation rates, employment rates, and student performance data to assess the achievement of educational objectives.

Action Planning: Based on the evaluation results, develop action plans to address areas that need improvement. These plans should outline specific strategies, activities, and timelines for implementing changes in the curriculum, instructional methods, or support services to enhance the achievement of educational objectives.

Continuous Monitoring: Continuously monitor the progress and impact of the action plans. Regularly review the data and assess whether the implemented changes are resulting in improved achievement of educational objectives. Adjust the plans as necessary to ensure continuous improvement.

Reporting: Prepare comprehensive reports summarizing the evaluation results and the actions taken to enhance the achievement of educational objectives. Share these reports with stakeholders, including program faculty, administrators, accrediting bodies, and industry

partners. Transparent reporting helps demonstrate accountability and commitment to quality education.

Processes for the achievement of the PEOs by graduates/alumni:

The processes for evaluating the achievement of program educational objectives by graduates/alumni include the following steps;

Alumni Engagement: Establish a strong connection with program graduates and alumni by actively engaging them in the evaluation process. This can be done through alumni associations, networking events, social media groups, and targeted communication channels.
Surveys and Questionnaires: Design and distribute surveys or questionnaires to alumni to collect their feedback on the achievement of educational objectives. Include questions that specifically address each objective and ask for self-assessment of their proficiency in relevant knowledge areas and skills. Seek their input on how well the program prepared them for their careers and the extent to which they are applying their education in their professional lives.
Interviews and Focus Groups: Conduct individual interviews or organize focus group discussions with selected alumni to gain more in-depth insights. These interactions allow for detailed discussions on their experiences, career trajectories, and the extent to which they perceive their education aligning with the program's objectives.
Portfolio and Project Reviews: Request alumni to share their professional portfolios or project samples related to their work in civil engineering. Reviewing these materials can provide tangible evidence of their ability to apply the knowledge and skills acquired during their studies.
Career Tracking and Success Assessment: Regularly track the careers of alumni to assess their professional achievements. Monitor their job positions, career advancements, leadership roles, involvement in professional organizations, patents, publications, and other relevant indicators of success. This information helps gauge the impact of the program's educational objectives on their career progression.
Alumni Networking Events and Workshops: Organize networking events and workshops that bring together alumni, current students, and industry professionals. These events provide opportunities for alumni to share their experiences, offer guidance, and mentor current students. It also allows for informal conversations that can shed light on the extent to which the educational objectives align with alumni experiences.

Industry Surveys and Employer Feedback: Collect feedback from employers and industry professionals who have hired program graduates. Seek their opinions on the competence, skills, and preparedness of the alumni in relation to the educational objectives. This external perspective can provide valuable insights into the strengths and areas for improvement in the program.

Alumni Award Recognition: Establish an alumni award recognition system to acknowledge outstanding achievements by alumni. Recognizing alumni who have made notable contributions to the civil engineering field can serve as inspiration for current students and demonstrate the program's success in achieving its educational objectives.

Continuous Improvement Feedback Loop: Create a mechanism for alumni to provide ongoing feedback and suggestions for program improvement. Alumni can offer valuable insights into emerging trends, industry needs, and changing expectations, helping to shape the curriculum and educational objectives.

Program Assessment and Accreditation: Utilize the feedback and data collected from alumni evaluations to inform the program's self-assessment and accreditation processes. Use the results to make evidence-based decisions and implement necessary changes to ensure the program remains aligned with the needs of graduates, employers, and the civil engineering profession.

How feedback and results obtained from the above processes are being used for the CQI of the programme:

Feedback and results obtained from the above processes play crucial role in driving continuous quality improvement CQI of the program;

Data Analysis: Thoroughly analyze the feedback and results obtained from various sources, such as alumni surveys, employer feedback, student evaluations, and assessment data. Look for patterns, trends, and areas of improvement in relation to the program's educational objectives.

Identify Strengths and Weaknesses: Identify the program's strengths and areas that require improvement based on the analysis of feedback and results. Determine which educational objectives are being effectively met and where there may be gaps or shortcomings.

Action Planning: Develop action plans to address the identified areas for improvement. Set specific goals, objectives, and strategies to enhance the program's effectiveness and ensure alignment with the educational objectives.

Curriculum Review and Enhancement: Review the program's curriculum to identify opportunities for improvement. Ensure that the curriculum aligns with the current industry trends, emerging technologies, and advancements in the field of civil engineering. Revise course content, learning outcomes, and teaching methods as needed.

Instructional Strategies: Evaluate the instructional strategies used in the program. Determine if they are effectively promoting the achievement of educational objectives. Explore innovative teaching methods, such as project-based learning, experiential learning, or the integration of new technologies, to enhance student engagement and learning outcomes.

Department Development: Provide professional development opportunities for faculty members to enhance their teaching skills, knowledge of industry trends, and familiarity with new technologies. Offer workshops, seminars, and conferences focused on pedagogical techniques and the latest advancements in civil engineering.

Student Support Services: Assess the availability and effectiveness of student support services, such as academic advising, mentoring, and career guidance. Strengthen these services to better support students in achieving the educational objectives and preparing for successful careers in civil engineering.

Stakeholder Engagement: Engage stakeholders, including alumni, industry professionals, and employers, in the continuous improvement process. Seek their input, perspectives, and suggestions on enhancing the program's alignment with the educational objectives. Collaborate with industry partners to ensure the curriculum remains relevant and meets industry needs.

Implementation of Changes: Implement the identified improvements and changes based on the action plans developed. Monitor the progress of implementation and track the impact of the changes on the achievement of educational objectives.

Evaluation and Monitoring: Continuously evaluate and monitor the effectiveness of the implemented changes. Collect feedback from stakeholders, assess student performance data, and track alumni success to gauge the program's improvement and its alignment with the educational objectives.

Continuous Feedback Loop: Maintain an ongoing feedback loop with stakeholders, including alumni, employers, and students. Regularly seek their input and perspectives on the program's effectiveness and the extent to which the educational objectives are being met. Use this feedback to inform future improvements and adjustments.

The extent to which the programmer’s various stakeholders are involved in these processes:

Stakeholders play a crucial role in shaping the curriculum, ensuring alignment with industry needs, and providing valuable insights into the effectiveness of the program. Here are the key stakeholders and their involvement in the process.

Department and Program Administrators: The departmental members and program administrators are directly involved in designing and developing the educational objectives for civil engineering. They have the expertise and knowledge of the field and contribute to the identification of the desired outcomes. They provide insights into the skills, knowledge areas, and competencies that graduates should possess to meet industry demands.

Industry Professionals and Employers: Engaging industry professionals and employers is vital to ensure that the program's educational objectives align with current industry requirements. Their input helps validate the relevance of the objectives and provides insights into the knowledge and skills needed in the workplace. They may participate in curriculum development committees, serve as advisors, or provide feedback on the program's alignment with industry expectations.

Alumni: Alumni play a valuable role in evaluating the achievement of educational objectives. Their experiences in the workforce provide firsthand insights into how well the program prepared them for their careers. Alumni can participate in surveys, interviews, and focus groups to provide feedback on the extent to which the educational objectives have been met and offer suggestions for improvement.

Students: Students are the primary beneficiaries of the program and should have a voice in shaping the educational objectives. Involving students in the process can provide insights into their aspirations, expectations, and career goals. They can provide feedback on the relevance and effectiveness of the objectives in preparing them for the civil engineering profession.

Accreditation Bodies: Accreditation bodies play a crucial role in ensuring the quality and relevance of civil engineering programs. They typically have established criteria and guidelines for educational objectives. In the accreditation process, stakeholders from accreditation bodies may review and assess the alignment of the program's objectives with their standards.

Advisory Boards and External Experts: Establishing advisory boards consisting of professionals from academia, industry, and professional organizations can provide valuable guidance and feedback on the educational objectives. These external experts contribute their knowledge and experience to validate the program's alignment with industry best practices and emerging trends.

Community and Society: Civil engineering programs have a responsibility to meet the needs of the broader community and society. Stakeholders from the community, government

organizations, and non-profit sectors can provide insights into the societal and environmental challenges that civil engineers should address. Their involvement ensures that the program's educational objectives align with the community's needs.

CQI strategies to be implemented in relation to PEOs:

Implementing continuous quality improvement strategies in relation to program educational objectives for civil engineering can help ensure that the program remains effective, relevant, and responsive to the evolving needs of the field. Here are some strategies that are employed;

Regular Program Assessment: Conduct regular assessments of the program's curriculum, instructional methods, and learning outcomes to determine their alignment with the educational objectives. Evaluate the effectiveness of courses, projects, and assessments in preparing students to achieve the desired outcomes.

Data-Driven Decision Making: Collect and analyze data from various sources, including student performance, alumni feedback, employer surveys, and industry trends. Use this data to inform decision-making processes and identify areas for improvement related to the educational objectives.

Stakeholder Engagement: Actively involve stakeholders, such as faculty, industry professionals, alumni, and students, in the program's continuous improvement efforts. Seek their input, perspectives, and feedback on the relevance and effectiveness of the educational objectives. Use their insights to shape program enhancements.

Curriculum Review and Revision: Regularly review the program's curriculum to ensure it remains up-to-date with industry advancements and emerging technologies. Assess the alignment of courses, topics, and learning outcomes with the educational objectives. Revise the curriculum as needed to address any gaps or changes in the field.

Integration of Experiential Learning: Incorporate experiential learning opportunities, such as internships, co-op programs, industry projects, and field experiences, into the curriculum. These hands-on experiences allow students to apply their knowledge and skills in real-world settings, enhancing their ability to achieve the educational objectives.

Faculty Development and Training: Provide professional development opportunities for faculty members to enhance their teaching methodologies, subject matter expertise, and understanding of industry trends. Offer workshops, seminars, and conferences that focus on innovative pedagogical techniques and advancements in civil engineering.

Continuous Feedback and Assessment: Establish mechanisms for continuous feedback and assessment from students, alumni, employers, and other stakeholders. Use surveys, focus groups, and interviews to gather their perspectives on the achievement of the educational objectives. Regularly review and act upon this feedback to drive program improvements.

Collaboration with Industry: Foster strong partnerships and collaborations with industry organizations, professional societies, and employers. Engage industry professionals in curriculum development, serve as guest lecturers, and provide input on the relevance of the educational objectives. Leverage their expertise to ensure the program prepares students for the demands of the field.

Integration of Emerging Technologies: Stay updated with emerging technologies and their impact on the civil engineering field. Incorporate relevant technologies, such as Building Information Modeling (BIM), advanced simulation tools, and data analytics, into the curriculum to equip students with the skills required to meet industry needs.

Outcome-Based Assessment: Implement outcome-based assessment strategies to measure student achievement of the educational objectives. Use direct and indirect assessment methods, including rubrics, exams, capstone projects, and portfolios, to evaluate the attainment of specific learning outcomes associated with the objectives.

Continuous Monitoring and Evaluation: Establish a system for ongoing monitoring and evaluation of the program's performance in relation to the educational objectives. Regularly track and analyze student outcomes, alumni success, and industry feedback. Use this information to identify areas for improvement and implement necessary changes.

4.0 Programme Outcomes POs

Program Outcomes POs reflect the vision and mission of ESUT while encompassing the essential knowledge, skills, and attributes that civil engineering graduates should possess. They serve as a guide for curriculum development, teaching methodologies, and assessment strategies to ensure that graduates are well-prepared to meet the challenges of the civil engineering profession and contribute to society. The POs for the programme are follows;

Engineering Knowledge: Graduates will have a strong foundation in mathematics, science, and engineering principles, applying this knowledge to analyze and solve civil engineering problems.

Problem Solving: Graduates will demonstrate the ability to identify, formulate, and solve complex civil engineering problems using a systematic and innovative approach.

Design and Development: Graduates will have the skills to design and develop civil engineering systems and infrastructure that meet specified requirements and consider factors such as sustainability, safety, and cost-effectiveness.
Conduct Investigations: Graduates will be able to plan and conduct experiments, as well as analyze and interpret data, to investigate civil engineering problems and make informed decisions.
Modern Tools Usage: Graduates will be proficient in using modern tools, techniques, and software relevant to civil engineering practice, including computer-aided design (CAD), simulation, and analysis tools.
Professional and Ethical Responsibility: Graduates will understand and adhere to professional ethics and responsibilities in civil engineering practice, considering the impact of their work on public health, safety, and welfare.
Communication Skills: Graduates will have effective communication skills, both oral and written, enabling them to present and communicate engineering concepts and designs to diverse audiences.
Teamwork and Leadership: Graduates will possess the ability to work collaboratively in multidisciplinary teams and demonstrate leadership qualities while contributing effectively to the accomplishment of common goals.
Lifelong Learning: Graduates will recognize the need for continuous learning and self-improvement, engaging in professional development activities and keeping abreast of advancements in civil engineering.
Social and Environmental Awareness: Graduates will understand the societal and environmental impact of civil engineering projects and demonstrate a commitment to sustainable development, promoting environmentally friendly practices.
Entrepreneurship and Innovation: Graduates will exhibit entrepreneurial skills, identifying and pursuing opportunities for innovation, technological advancements, and sustainable solutions in civil engineering.
Professional Development: Graduates will recognize the importance of professional organizations and engage in activities that enhance their professional growth and contribute to the advancement of the civil engineering field.

How the POs relate with the PEOs:

In the field of civil engineering, program outcomes and program educational objectives are both important components of an educational program's assessment and evaluation. They are interconnected and contribute to the overall success of the program. Programme outcomes provide the specific skills and knowledge that students should acquire, while program educational objectives represent the long-term impact that graduates are expected to have in their careers. The program educational objectives guide the development of the curriculum, and the program outcomes help assess whether the educational objectives are being met. Continuous assessment and evaluation of program outcomes ensure that the educational objectives remain relevant and the program maintains its quality and effectiveness.

The program educational objectives are derived from the needs of various stakeholders, including employers, industry professionals, alumni, and the broader society. They represent the desired outcomes of the civil engineering program in terms of the impact graduates are expected to have on the profession and society. The program outcomes, on the other hand, are the specific knowledge, skills, and abilities that students acquire during their education to meet the program educational objectives. The program outcomes serve as building blocks or stepping stones towards achieving the broader objectives.

Program Outcomes (POs): Program outcomes are statements that describe what students are expected to know and be able to do by the time they complete their civil engineering program. These outcomes are specific to the discipline and provide a framework for designing and evaluating the curriculum. Some of program outcomes are:

- Apply knowledge of mathematics, science, and engineering principles to solve civil engineering problems.
- Design and conduct experiments, as well as analyze and interpret data relevant to civil engineering.
- Design civil engineering systems, components, or processes to meet desired needs.
- Communicate effectively in written, oral, and graphical forms within the context of civil engineering.
- Consider societal, environmental, and economic factors in civil engineering design and decision-making.
- Function effectively as an individual and in multidisciplinary teams, with the ability to take leadership roles.

- ❖ Recognize the need for lifelong learning and engage in professional development activities.

Program Educational Objectives (PEOs): Program educational objectives are broad statements that describe the expected accomplishments of graduates in their professional careers a few years after completing their civil engineering program. PEOs focus on the long-term impact of the education and aim to align with the mission and goals of the educational institution. Some of the program educational objectives are:

- ❖ Graduates will have successful careers in civil engineering or related fields, demonstrating technical competence, professional ethics, and the ability to adapt to evolving technologies.
- ❖ Graduates will contribute to the design, construction, and maintenance of sustainable civil infrastructure, considering environmental and societal needs.
- ❖ Graduates will engage in lifelong learning, pursuing advanced education, professional development, and staying updated with emerging trends and research in civil engineering.
- ❖ Graduates will demonstrate effective communication skills, work collaboratively in multidisciplinary teams, and possess leadership qualities.

How the POs encompass and are consistent with the 12 POs of section 3.2.2 of the Manual:

While civil engineering programs have specific outcomes tailored to the discipline, they align with the broader program outcomes for general engineering to ensure that graduates possess a well-rounded engineering education. This consistency allows for the transferability of skills and knowledge between different engineering disciplines, enabling civil engineers to work collaboratively with professionals from other engineering fields on interdisciplinary projects.

Program outcomes for civil engineering are typically a subset of the broader program outcomes for general engineering. While civil engineering is a specialized branch of engineering, it still shares fundamental principles and knowledge with other engineering disciplines. Therefore, the program outcomes for civil engineering encompass and remain consistent with the program outcomes for general engineering in several ways:

Core Engineering Knowledge: Both civil engineering and general engineering programs aim to provide students with a strong foundation in core engineering principles, including mathematics,

physics, mechanics, materials science, and engineering design. The program outcomes for civil engineering will reflect the specific application of these principles to civil engineering systems and infrastructure.

Problem-Solving Skills: Engineering programs, including civil engineering, emphasize the development of analytical and problem-solving skills. These skills are essential for identifying, formulating, and solving engineering problems. The program outcomes for civil engineering will focus on applying these skills to civil engineering challenges, such as structural analysis, transportation planning, geotechnical engineering, or water resources management.

Technical Competence: Both civil engineering and general engineering programs aim to equip students with technical competence in their chosen field. While civil engineering focuses on specific areas like structural engineering, transportation engineering, or environmental engineering, the program outcomes for civil engineering will demonstrate mastery of the technical knowledge and skills required for civil engineering practice.

Professional Skills: Engineering programs, including civil engineering, place importance on developing professional skills such as effective communication, teamwork, ethical considerations, and lifelong learning. These skills are vital for success in any engineering discipline. The program outcomes for civil engineering will include these professional skills within the context of civil engineering practice.

Societal and Environmental Factors: Engineering programs, including civil engineering, recognize the importance of considering societal, economic, and environmental factors in engineering design and decision-making. The program outcomes for civil engineering will emphasize the integration of these factors into the design and management of civil infrastructure.

PO definition or elements/performance indicators:

Program outcome performance indicators can vary depending on the specific objectives and goals of a program. However, here are some common performance indicators that were used to evaluate the programme outcome:

Graduation Rate: The percentage of students who successfully complete the civil engineering program within the expected timeframe.

Employment Rate: The percentage of graduates who secure employment in the civil engineering field within a specified time period after graduation.

Professional Licensure: The percentage of graduates who pass professional licensure exams (such as the Fundamentals of Engineering and Professional Engineering exams) required for practicing civil engineering.
Student Retention Rate: The percentage of students who continue and complete the civil engineering program after the first year or throughout the entire program.
Student Satisfaction: Surveys or assessments that measure student satisfaction with various aspects of the civil engineering program, including curriculum, faculty, resources, facilities, and overall educational experience.
Employer Satisfaction: Surveys or assessments that measure employer satisfaction with the knowledge, skills, and abilities of civil engineering graduates hired by their organizations.
Research and Innovation: The number and quality of research publications, patents, innovations, or collaborations with industry partners, indicating the program's contribution to advancing the field of civil engineering.
Alumni Success: The success and achievements of civil engineering program alumni, including positions held, professional recognition, and contributions to the field.
Program Accreditation: The accreditation status of the civil engineering program by recognized accrediting bodies, such as COREN.
Graduates' Further Education: The percentage of graduates who pursue advanced degrees or further education in civil engineering or related fields.

Processes used to establish and review the POs, and the extent to which stakeholders are involved:

By involving stakeholders through surveys, meetings, interviews, and other tools, the program outcomes can be established, reviewed, and revised to align with the needs and ensure continuous improvement. Establishing and reviewing program outcomes involves a systematic and collaborative approach, engaging various stakeholders. Here are the processes used and the extent of stakeholder involvement, along with suggested tools, frequencies, and timelines;

1. Program Assessment Committee Formation:
    - ❖ The program assessment committee is responsible for overseeing the establishment and review of program outcomes.
    - ❖ Stakeholders involved: Faculty members, program coordinators, department heads.
    - ❖ Tools: Meetings, email communications.

- ❖ Frequency: Initially formed at the beginning of program development/review and periodically thereafter for updates.
- ❖ Timeline: Dependent on the program's review cycle (e.g., every 3-5 years).

2. Identifying Stakeholders:
   - ❖ Identify and involve relevant stakeholders who have a vested interest in the program outcomes.
   - ❖ Stakeholders involved: Faculty members, current students, alumni, industry professionals, employers.
   - ❖ Tools: Surveys, interviews, focus group discussions.
   - ❖ Frequency: Typically conducted at the beginning of program development/review and periodically for updates.
   - ❖ Timeline: Conducted during the initial stages of program development/review.
3. Defining Program Outcomes:
   - ❖ Engage stakeholders in defining clear and measurable program outcomes that align with the program's mission, vision, and industry requirements.
   - ❖ Stakeholders involved: Faculty members, industry professionals, accreditation bodies, program coordinators.
   - ❖ Tools: Meetings, workshops, surveys.
   - ❖ Frequency: Conducted during the initial stages of program development/review and periodically for updates.
   - ❖ Timeline: Dependent on the program's review cycle.
4. Curriculum Mapping:
   - ❖ Map the program outcomes to the curriculum to ensure that each outcome is addressed adequately.
   - ❖ Stakeholders involved: Faculty members, program coordinators, curriculum committee.
   - ❖ Tools: Curriculum review meetings, documentation analysis.
   - ❖ Frequency: Conducted during the initial stages of program development/review and periodically for updates.
   - ❖ Timeline: Dependent on the program's review cycle.
5. Stakeholder Feedback:
   - ❖ Seek feedback from stakeholders on the relevance and effectiveness of the program outcomes.
   - ❖ Stakeholders involved: Current students, alumni, industry professionals, employers.
   - ❖ Tools: Surveys, interviews, focus group discussions.

- ❖ Frequency: Conducted periodically, preferably annually or biennially.
- ❖ Timeline: Timelines may vary, but feedback collection should be planned to allow for analysis and incorporation into the program review process.

6. Program Review and Revision:
   - ❖ Conduct a comprehensive review of the program outcomes, considering feedback and data gathered from stakeholders.
   - ❖ Stakeholders involved: Faculty members, program coordinators, department heads, accreditation bodies.
   - ❖ Tools: Meetings, data analysis, documentation review.
   - ❖ Frequency: Conducted periodically, typically every 3-5 years.
   - ❖ Timeline: Dependent on the program's review cycle.
7. Accreditation Process:
   - ❖ Engage with relevant accreditation bodies to ensure the program outcomes meet the required standards.
   - ❖ Stakeholders involved: Accreditation bodies, faculty members, program coordinators.
   - ❖ Tools: Documentation review, meetings, self-assessment reports.
   - ❖ Frequency: Typically conducted as part of the program review process, aligned with accreditation cycles.
   - ❖ Timeline: Dependent on the accreditation body's requirements and the program's review cycle.

Mapping of courses with POs:

The mapping process ensures comprehensive coverage of the desired learning outcomes throughout the curriculum. Additionally, the mapping should be reviewed periodically and updated as necessary to ensure alignment with industry trends, technological advancements, and evolving educational standards. Mapping courses with program outcomes is essential to ensure that the curriculum effectively addresses the desired learning outcomes. Here's a typical case of courses mapped with program outcomes;

Program Outcome 1: Apply engineering knowledge and principles to solve civil engineering problems.

- ❖ Course 1: Introduction to Civil Engineering

- Course 2: Engineering Mechanics
- Course 3: Structural Analysis
- Course 4: Geotechnical Engineering
- Course 5: Transportation Engineering
- Course 6: Environmental Engineering

Program Outcome 2: Design and analyze civil engineering systems and structures.

- Course 1: Structural Design
- Course 2: Geotechnical Design
- Course 3: Transportation Systems Design
- Course 4: Environmental Systems Design
- Course 5: Hydraulic Engineering
- Course 6: Construction Engineering and Management

Program Outcome 3: Utilize appropriate tools and technologies for civil engineering practice.

- Course 1: Computer-Aided Design (CAD)
- Course 2: Geographic Information Systems (GIS)
- Course 3: Construction Materials and Testing
- Course 4: Surveying and Geomatics
- Course 5: Construction Project Management
- Course 6: Numerical Methods in Engineering

Program Outcome 4: Communicate effectively and work collaboratively in multidisciplinary teams.

- Course 1: Technical Communication for Engineers
- Course 2: Engineering Ethics and Professionalism
- Course 3: Engineering Project Management
- Course 4: Engineering Economics
- Course 5: Engineering Leadership and Teamwork

Program Outcome 5: Demonstrate knowledge of sustainable practices and environmental stewardship in civil engineering.

- Course 1: Sustainable Design and Green Building
- Course 2: Water Resources Engineering
- Course 3: Environmental Impact Assessment
- Course 4: Waste Management and Pollution Control
- Course 6: Environmental Regulations and Compliance

How the assessment results are applied to develop and improve POs:

Assessment results provide actionable data that inform decision-making processes for program improvement. By leveraging assessment data effectively, civil engineering programs can refine their program outcomes, curriculum, teaching methods, and resources to ensure that students achieve the desired learning outcomes and meet industry needs. Assessment results play a crucial role in developing and improving program outcomes. Here's how assessment results are applied in the process;

Identify Strengths and Weaknesses: Assessment results provide insights into the strengths and weaknesses of the program outcomes. By analyzing the assessment data, educators can identify areas where students excel and areas that need improvement.
Gap Analysis: A comparison between the desired program outcomes and the assessment results helps identify any gaps or misalignments. If assessment results indicate that certain outcomes are not adequately achieved, adjustments can be made to the program outcomes to address those gaps.
Curriculum Review and Revision: Assessment results inform curriculum review and revision processes. If assessment data reveals that students are struggling with specific program outcomes, curriculum adjustments can be made to ensure those outcomes are appropriately addressed in the courses.
Teaching and Learning Strategies: Assessment results provide feedback on the effectiveness of teaching and learning strategies employed within the program. If assessment data indicates that students are not achieving desired outcomes, educators can modify instructional methods, incorporate new pedagogical approaches, or utilize additional resources to enhance student learning.

Resource Allocation: Assessment results can inform resource allocation decisions. If certain program outcomes consistently show lower performance, resources such as faculty expertise, instructional materials, or laboratory facilities can be allocated or enhanced to support the improvement of those outcomes.

Professional Development: Assessment results can guide professional development initiatives for faculty members. If certain outcomes consistently show lower performance, faculty members can participate in workshops, training, or collaborative activities to enhance their knowledge and skills related to those outcomes.

Continuous Improvement: Assessment results serve as a basis for continuous improvement efforts. By regularly reviewing assessment data, educators can track progress, identify trends, and implement targeted interventions to enhance program outcomes over time.

Accreditation Requirements: Assessment results are often used as evidence to meet accreditation requirements. By using assessment data to demonstrate continuous improvement and align with accreditation standards, programs can ensure compliance and maintain accreditation status.

Materials, including student work and other evidence, the demonstrate achievement of the POs:

When assessing the achievement of program outcomes, a combination of these materials and evidence can provide a comprehensive picture of students' abilities and the effectiveness of the program. It is important to establish assessment criteria and rubrics in advance to ensure consistency and objectivity in evaluating student work and other evidence. To demonstrate the achievement of program outcomes, various materials and evidence were utilized.

1. Student Work Samples:
    - ❖ Assignments, projects, and reports showcasing students' application of engineering knowledge and skills.
    - ❖ Design projects demonstrating the ability to analyze and solve civil engineering problems.
    - ❖ Technical drawings, models, or simulations created by students to address engineering challenges.
2. Portfolios:
    - ❖ Compiled collections of students' best work that aligns with specific program outcomes.
    - ❖ Portfolios can include design projects, research papers, lab reports, and other relevant artifacts.

3. Laboratory Reports and Experimentation:
    - ❖ Lab reports showcasing students' ability to conduct experiments, analyze data, and draw conclusions.
    - ❖ Reports may include calculations, observations, graphs, and summaries of findings.
4. Case Studies and Field Studies:
    - ❖ Reports or presentations analyzing real-world civil engineering projects or scenarios.
    - ❖ Case studies demonstrate students' ability to apply theoretical knowledge to practical situations and make informed decisions.
5. Professional Presentations and Conferences:
    - ❖ Students presenting their work at professional conferences, seminars, or symposiums.
    - ❖ Presentations highlight students' ability to communicate technical information effectively to a professional audience.
6. External Competitions and Awards:
    - ❖ Students participating in and receiving recognition in external competitions related to civil engineering.
    - ❖ Awards and achievements demonstrate students' abilities and the quality of their work.
7. Research Papers and Publications:
    - ❖ Research papers authored by students and published in relevant journals or conference proceedings.
    - ❖ Publications showcase students' ability to conduct research, analyze data, and contribute to the field.
8. Internship or Co-op Reports:
    - ❖ Reports or evaluations from industry internships or cooperative education experiences.
    - ❖ These documents demonstrate students' ability to apply engineering concepts in real-world settings and their professional growth.
9. Alumni Surveys and Employment Data:
    - ❖ Surveys or employment data tracking the careers and achievements of graduates.
    - ❖ This evidence showcases the success of alumni in applying the program outcomes in their professional careers.

The extent of involvement of stakeholders in the processes:

In civil engineering projects, stakeholders play a crucial role in influencing and shaping program outcomes. The extent of stakeholder involvement can vary depending on the specific project, its

complexity, and the stakeholders' interests and influence. Some key points regarding stakeholder involvement in program outcomes are as follows;

Identification of Stakeholders: Identifying and engaging with stakeholders is a critical first step in any civil engineering program. Stakeholders can include project owners, government agencies, local communities, environmental organizations, regulatory bodies, contractors, and end-users. Each stakeholder group may have different expectations, concerns, and priorities.

Requirements Gathering: Stakeholders often provide valuable input during the requirements gathering phase of a civil engineering program. Their involvement helps to define project objectives, functional requirements, and performance criteria. Stakeholder consultations, meetings, and workshops are conducted to gather their perspectives and ensure their needs are considered.

Design and Planning: During the design and planning stages, stakeholders can provide valuable insights and expertise. Their involvement can help identify potential design issues, assess environmental impacts, and propose alternatives. Stakeholders can contribute to the decision-making process by providing feedback on design options, sustainability considerations, and overall project feasibility.

Project Approval and Permits: Stakeholders' involvement is crucial when seeking project approvals and permits. Regulatory bodies, local communities, and environmental organizations may review and comment on project plans and environmental impact assessments. Their input can influence the conditions imposed on the project and the overall viability of the program.

Construction and Implementation: Stakeholders' involvement continues during the construction and implementation phase. Regular communication and coordination with stakeholders help ensure that project activities are aligned with their expectations and minimize disruptions. Contractors may engage with stakeholders to address any concerns, provide progress updates, and manage potential conflicts.

Monitoring and Evaluation: Stakeholders often participate in monitoring and evaluating project outcomes. They may assess the program's performance against established criteria, such as safety, environmental impact, cost-effectiveness, and community benefits. Stakeholder feedback and input can help identify areas for improvement and guide future project iterations.

Long-term Operations and Maintenance: In some cases, stakeholders remain involved in the long-term operations and maintenance of civil engineering infrastructure. For example, public infrastructure projects may require ongoing engagement with local communities and government agencies for maintenance, upgrades, and addressing operational challenges.

CQI strategies to be implemented in relation to POs:

Continuous Quality Improvement (CQI) strategies can be implemented in civil engineering programs to enhance program outcomes and ensure continuous improvement. Some CQI strategies that are applied are as follows;

Define Clear Quality Objectives: Establishing clear quality objectives for the civil engineering program is essential. These objectives should be specific, measurable, achievable, relevant, and time-bound (SMART). They provide a clear direction for the program and serve as a benchmark for measuring success.

Stakeholder Engagement: Actively involve stakeholders throughout the program to gather feedback and insights. Conduct regular meetings, workshops, and surveys to understand their expectations, concerns, and suggestions. This engagement helps align the program with stakeholder needs and enhances overall satisfaction.

Robust Project Planning and Execution: Develop a comprehensive project plan that includes defined processes, timelines, and performance metrics. Ensure that roles, responsibilities, and deliverables are clearly communicated to all team members. Regularly monitor progress, identify bottlenecks, and take corrective actions to keep the program on track.

Quality Assurance and Quality Control: Implement quality assurance processes to ensure that the program adheres to industry standards, regulations, and best practices. Conduct regular quality control inspections, tests, and audits to identify and rectify any deviations or non-conformities. This helps maintain the desired level of quality throughout the program.

Continuous Monitoring and Evaluation: Establish mechanisms to continuously monitor and evaluate program performance. Collect relevant data and metrics to assess progress against established objectives. Regularly review the data, identify trends, and take proactive measures to address any deviations or areas for improvement.

Lessons Learned and Knowledge Sharing: Encourage a culture of learning and knowledge sharing within the program. Conduct post-project reviews to identify lessons learned, best practices, and areas for improvement. Document and communicate these findings to the broader team to foster continuous learning and improvement.

Training and Professional Development: Invest in the training and professional development of program staff. Provide opportunities for acquiring new skills, knowledge, and certifications

relevant to civil engineering practices. This helps enhance the expertise of the team and promotes a culture of continuous improvement.

Innovation and Technology Adoption: Stay updated with emerging technologies, innovative practices, and industry trends. Evaluate their applicability to the program and consider adopting them when appropriate. Embracing technological advancements can improve efficiency, accuracy, and overall program outcomes.

Feedback Mechanisms and Customer Satisfaction: Implement feedback mechanisms, such as surveys or feedback forms, to collect input from stakeholders and end-users. Regularly assess customer satisfaction to identify areas of improvement and address any concerns promptly.

Benchmarking and Best Practice Adoption: Benchmark program performance against similar projects or industry standards. Identify best practices from other successful civil engineering programs and consider their adoption to improve program outcomes.

Course Learning Outcomes CLOs for Civil Engineering Program in line with the Vision and Mission of Enugu State University of Science and Technology ESUT:

1. Vision: To be a world-class center of excellence in scientific and technological education and research.
   Mission: To produce highly skilled graduates in science and technology who can contribute to the socio-economic development of the nation.
   Course Learning Outcome: Graduates of the Civil Engineering program will be able to apply scientific and technological principles to solve complex engineering problems, demonstrating competence and proficiency in their field.
2. Vision: To promote sustainable development through the application of science and technology.
   Mission: To provide education and training that emphasizes sustainable practices and equips students with the knowledge and skills to address environmental and societal challenges.
   Course Learning Outcome: Graduates of the Civil Engineering program will have a comprehensive understanding of sustainable engineering practices and will be able to design and implement environmentally friendly solutions for infrastructure development.

3. Vision: To foster innovation and entrepreneurship in science and technology.
   Mission: To nurture creativity, innovation, and an entrepreneurial mindset among students, enabling them to contribute to technological advancements and economic growth.
   Course Learning Outcome: Graduates of the Civil Engineering program will possess the ability to think critically, identify problems, and develop innovative solutions, encouraging entrepreneurship and promoting a culture of innovation in the field of civil engineering.
4. Vision: To produce ethically and socially responsible graduates.
   Mission: To instill ethical values, social responsibility, and professionalism in students, preparing them to make positive contributions to society.
   Course Learning Outcome: Graduates of the Civil Engineering program will demonstrate a strong sense of professional ethics, social responsibility, and an understanding of the impact of their work on society, ensuring their contributions align with the values of Enugu State University of Science and Technology.
5. Vision: To collaborate with local industries and communities for mutual growth and development.
   Mission: To establish partnerships and engage with industries, government agencies, and communities to address societal needs and foster regional development.
   Course Learning Outcome: Graduates of the Civil Engineering program will possess effective communication and collaboration skills, enabling them to work in multidisciplinary teams and engage with stakeholders to develop sustainable infrastructure solutions that meet the needs of local industries and communities.

These course learning outcomes align with the vision and mission of Enugu State University of Science and Technology by emphasizing excellence, sustainability, innovation, social responsibility, and collaboration, preparing graduates to contribute to the development of their communities and the nation as a whole.

Mapping of CLOs to related POs:

Mapping of Course Learning Outcomes (CLOs) to Related Programme Outcomes (POs);

1. Course Learning Outcome: Graduates of the Civil Engineering program will be able to apply scientific and technological principles to solve complex engineering problems, demonstrating competence and proficiency in their field.
   Related Programme Outcome: PO1 - Apply scientific and engineering knowledge to analyze and solve civil engineering problems.
2. Course Learning Outcome: Graduates of the Civil Engineering program will have a comprehensive understanding of sustainable engineering practices and will be able to design and implement environmentally friendly solutions for infrastructure development.
   Related Programme Outcome: PO2 - Apply sustainable design principles and practices in civil engineering projects.
3. Course Learning Outcome: Graduates of the Civil Engineering program will possess the ability to think critically, identify problems, and develop innovative solutions, encouraging entrepreneurship and promoting a culture of innovation in the field of civil engineering.
   Related Programme Outcome: PO3 - Demonstrate creativity, innovation, and an entrepreneurial mindset in civil engineering projects.
4. Course Learning Outcome: Graduates of the Civil Engineering program will demonstrate a strong sense of professional ethics, social responsibility, and an understanding of the impact of their work on society, ensuring their contributions align with the values of Enugu State University of Science and Technology.
   Related Programme Outcome: PO4 - Exhibit professional ethics, social responsibility, and awareness of the societal impact of civil engineering projects.
5. Course Learning Outcome: Graduates of the Civil Engineering program will possess effective communication and collaboration skills, enabling them to work in multidisciplinary teams and engage with stakeholders to develop sustainable infrastructure solutions that meet the needs of local industries and communities.
   Related Programme Outcome: PO5 - Demonstrate effective communication, teamwork, and leadership skills in civil engineering projects.

By aligning the Course Learning Outcomes (CLOs) with the Related Programme Outcomes (POs), the Civil Engineering program ensures that students achieve the desired educational outcomes while addressing the specific goals and objectives outlined by Enugu State University of Science and Technology. This mapping helps in evaluating and assessing the effectiveness of the curriculum in producing competent and well-rounded civil engineering graduates.

Relationship between the CLOs and the POs:

The relationship between Course Learning Outcomes (CLOs) and Programme Outcomes (POs) in civil engineering signifies how the attainment of specific learning outcomes within individual courses contributes to the overall achievement of broader program outcomes. Breakdown of the relationship is as follows;

1. CLOs contribute to the achievement of specific POs: Each CLO is designed to address a specific aspect of the overall knowledge, skills, or competencies expected of a civil engineering graduate. By mastering the CLOs, students make progress toward achieving the corresponding POs.
2. CLOs are building blocks for POs: The CLOs serve as foundational building blocks upon which the broader POs are constructed. By achieving the CLOs, students acquire the necessary knowledge, abilities, and attitudes needed to fulfill the POs.
3. Alignment ensures coherence and progression: The alignment between CLOs and POs ensures coherence and progression throughout the civil engineering program. The CLOs of foundational courses establish the fundamental knowledge and skills required to move forward, while the CLOs of advanced courses build upon and extend the learning outcomes of earlier courses to achieve higher-level POs.
4. Assessment of CLOs informs the achievement of POs: The assessment of CLOs provides evidence of students' mastery of specific learning outcomes. By evaluating students' performance on CLOs, instructors and program evaluators can gauge the extent to which the program is effectively preparing students to achieve the corresponding POs.
5. Comprehensive coverage of POs through multiple CLOs: Each PO is typically addressed by multiple CLOs across different courses within the civil engineering program. This comprehensive coverage ensures that students develop the knowledge, skills, and competencies necessary to meet the overarching program outcomes.

In summary, the CLOs in civil engineering courses directly contribute to the attainment of specific POs, acting as stepping stones that build upon one another and collectively lead to the fulfillment of the broader program objectives. The alignment between CLOs and POs ensures coherence, progression, and effective assessment of student learning within the civil engineering program.

Course Code	**CVE 354**
Course Title	**Structural Mechanics I**
Credit Units	**2 Units, Core Course, Lecture week 15**
1. Lecturer's Names	**Engr. Mrs .J .N Ugwu and Dr .J .I Enem**
2. Phone Numbers	**08034161148; 08036842738**
3. E-Mail Addresses	**Juliet.ugwu@esut.edu.ng; johnmartins.enem@esut.edu.ng**

4. Course Contents

Kinematics analysis of structures, various methods of verifying geometrical instability of structures. Analysis of statically indeterminate structures including beams, frames, arches, trusses, three dimensional structures. Influence lines and various methods of their determination. Application of influence lines in analysis of determinate structures under the action of moving load; slopes and deflections.

5. **Learning Outcome**

At the end of this course, the student should be able to:

- Explain the concept of statical determinacy of structures and kinematic determinacy
- Estimate the forces and deflections in statically determinate trusses
- Estimate the shear force, bending moments, axial forces, slopes and deflections in staically determinate beams, portal frames, arches
- Derive and analyse influence lines for moving loads on beams.

6. Week and days of lectures

Week	Days	Period	Topics	Learning outcome
1	Tuesday	11am-1pm	Introduction to structural mechanics and first assignment given	Student to know what the course is all about and assignment given to refresh on what they have done before related to the course.
2	Tuesday	11am-1pm	Statical indeterminacy	Student should be able to determine if a structure is determinate or the degree of

				indeterminacy statically.
3	Tuesday	11am-1pm	Statical indeterminacy and Kinematic determinacy	Student should be able to determine if a structure is statically determinate or the degree of indeterminacy and the kinematic determinacy of the structure..
4	Tuesday	11am-1pm	Kinematic determinacy and analysis of determinate beams	Student should be able to determine if a structure is statically determinate or the degree of indeterminacy and the kinematic determinacy of the structure. Introduction to beam analysis
5	Tuesday	11am-1pm	Analysis of determinate beams	Student should be able to know the classifications or types of beams with various loading types and draw the internal stress diagrams of determinate beams.
6	Tuesday	11am-1pm	Analysis of determinate beams	Student should be able to know the classifications or types of beams with various loading types and draw the internal stress diagrams of determinate beams.
7	Tuesday	11am-1pm	Analysis of determinate beams and portal frames	Student should be able to know the classifications or types of beams with various loading types and draw the internal stress diagrams of determinate beams and frames.
8	Tuesday	11am-1pm	Mid-semester quiz and assignment	Assessing the student ability on topics done so far
9	Tuesday	11am-1pm	Analysis of determinate frame structures	Student should be able to analyse portable frame structures and draw the internal stress diagrams
10	Tuesday	11am-1pm	Analysis of determinate frame structures and	Student should be able to analyse portable frame structures and draw

			Arches	the internal stress diagrams
11	Tuesday	11am-1pm	Analysis of Arch structures	Students should be able analyse determinate arch structures
12	Tuesday	11am-1pm	Analysis of Arch structures	Students should be able analyse determinate arch structures
13	Tuesday	11am-1pm	Analysis of Arch structures and the use of influence line in analysis	Students should be able analyse determinate arch structures
14	Tuesday	11am-1pm	Analysis of influence lines for moving loads	Students should be able to apply influence lines in analysis
15	Tuesday	11am-1pm	Analysis of influence lines for moving loads and general revision	Students should be able to apply influence lines in analysis

7. Office Hours for Students

Wednesday 1pm - 3pm and Friday 11am – 2pm

8. Schedule for Quiz and Exams

Inception Assignment	Mid-Semester Quiz and Assignment	Revision
Week 1	Week 8	Week 15

9. Model answers/ marking schemes of examinations
Please find attached documents

10. Samples of examination booklets
Please find attached documents

11. A brief write-up on how the course learning could be improved
Course learning could be improved with the use of good instructional materials

Academic Sessions: 2017/2018, 2018/2019, 2019/2020, 2020/2021, 2021/2022
Second Semester
Course Code: CVE 352
Course Title: Design of Reinforced Concrete Structures
Credit Units: 3 Units, Core Lecture Hours 30

1. Lecturers Name: Engr. Dr. J.I. Enem and Engr. Dr. P.N.Onuamah
2. Phone Nos: +2348036842738, +234803342106
3. Email: johnmartins.enem@esut.edu.ng

4(i) Course contents:

Reinforced concrete as a structural material, specification, concrete strength classes. Various kinds of reinforcing bars, Characteristics. Application of RC in building, tanks and other structures, construction member – particularities of design. Industrial buildings. Most frequently used schemes crane girders etc.

4(ii) Course Learning outcomes

At the end of the course students should be able to:

i. Explain the properties of reinforced concrete
ii. Explain the limit state design
iii. Understand the Analysis of the structure at ultimate limit state
iv. Formulate formulas for Analysis of the section
v. To formulate the theory and derivation of the design equations for shear, bond and torsion
vi. Understand the serviceability, durability and stability requirements
vii. Understand the preliminary analysis, member sizing, detailed analysis, design of reinforcement and serviceability calculations for reinforced concrete beam.
viii. To understand the different types of slab, detailed analysis, design reinforcement.
ix. To understand the different types of column, detailed analysis, design of reinforcement

x. To understand the different types of foundation, detailed analysis, design of reinforcement

5. Weeks and Days of Lectures

Week	Days	Period	Topics
1	Wednsday and Friday	11am-1pm	Introduction to reinforced concrete design: Properties of reinforced concrete
2	Wednsday and Friday	11am-1pm	Limit state design
3	Wednsday and Friday	11am-1pm	Analysis of the structure at ultimate limit state and Analysis of the section
4	Wednsday and Friday	11am-1pm	Theory and derivation of the design equations for shear, bond and torsion
5	Wednsday and Friday	11am-1pm	Serviceability, durability and stability requirements
6	Wednsday and Friday	11am-1pm	Different types of slab, detailed analysis, design of reinforcement
7	Wednsday and Friday	11am-1pm	Strength of concrete
8	Wednsday and Friday	11am-1pm	Mid semester quiz/Assignment.
9	Wednsday and Friday	11am-1pm	Preliminary analysis, member sizing, detailed analysis, design of reinforcement and serviceability calculations for reinforced concrete beam
10	Wednsday and Friday	11am-1pm	Preliminary analysis, member sizing, detailed analysis, design of reinforcement and serviceability calculations for reinforced concrete beam
11.	Wednsday and Friday	11am-1pm	Different types of column, detailed analysis, design of reinforcement.
12	Wednsday and Friday	11am-1pm	Different types of column, detailed analysis, design of reinforcement.

13	Wednsday and Friday	11am-1pm	Different types of foundation, detailed analysis, design of reinforcement.
14	Wednsday and Friday	11am-1pm	Different types of foundation, detailed analysis, design of reinforcement.
15	Wednsday and Friday	11am-1pm	Serviceability limit state

6. Office hours for students

Wednesday 9am-12noon, and Friday 9am -12noon.

7. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Assignment	**Mid-Semester Quiz Assignment**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents.

8. Model answers/ marking schemes of examinations
   Please find attached documents.
9. Samples of examination booklets/scripts.
   Please find attached documents.
10. A brief write-up on how the course learning could be improved.

Course learning could be improved with the use of good instructional materials and adequate laboratory equipment.

Academic Sessions: 2017/2018, 2018/2019, 2019/2020, 2020/2021, 2021/2022
Second Semester
Course Code: CVE 338
Course Title: CONCRETE TECHNOLOGY

Credit Units: **2 Units, Core Lecture Hours 30**

3. Lecturers Name: Engr. Dr. J.I. Enem and Engr. Dr. P.N.Onuamah
4. Phone Nos: +2348036842738, +234803342106
3. Email: johnmartins.enem@esut.edu.ng

4(i) Course contents:

Rheology of fresh concrete, mechanical properties of hardened concrete, non-destructive testing methods and relationship between static and dynamic moduli. Elasticity shrinkage and creep of concrete; durability of concrete, light weight and high density concrete. Pressure against formwork, maturity of concrete. Mix design production and quality control, transportation and placing of concrete, concreting equipment.

4(ii) Course Learning outcomes

At the end of the course students should be able to:

i. Explain the different materials that make up the concrete
ii. Understand the analogy of fresh concrete
iii. Understand strength of concrete
iv. Explain the terms Elasticity, Creep and Shrinkage
v. Explain Durability of concrete
vi. Understand methods of testing of hardened concrete
vii. To understand how to carry out concrete mix design

5. Weeks and Days of Lectures

Week	Days	Period	Topics
1	Thursday	9am-11am	Introduction to Concrete technology
2	Thursday	9am-11am	Different materials that make up the concrete: Cement, Aggregate; Water; Admixture.
3	Thursday	9am-11am	Different materials that make up the concrete: Cement, Aggregate; Water; Admixture.
4	Thursday	9am-11am	Different materials that make up the concrete:

			Cement, Aggregate; Water; Admixture.
5	Thursday	9am-11am	Fresh Concrete
6	Thursday	9am-11am	Fresh Concrete
7	Thursday	9am-11am	Strength of Concrete
8	Thursday	9am-11am	Mid semester quiz/Assignment.
9	Thursday	9am-11am	Strength of Concrete
10	Thursday	9am-11am	Elasticity, Creep and Shrinkage
11.	Thursday	9am-11am	Durability of concrete
12	Thursday	9am-11am	Testing of hardened concrete.
13	Thursday	9am-11am	Testing of hardened concrete.
14	Thursday	9am-11am	Concrete mix design
15	Thursday	9am-11am	Concrete mix design

11. Office hours for students

Wednesday 9am-12noon, and Friday 9am -12noon.

12. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Assignment	**Mid-Semester Quiz Assignment**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents.

13. Model answers/ marking schemes of examinations
    Please find attached documents.
14. Samples of examination booklets/scripts.
    Please find attached documents.
15. A brief write-up on how the course learning could be improved.

Course learning could be improved with the use of good instructional materials and adequate laboratory equipment.

Academic Sessions: 2017/2018, 2018/2019, 2019/2020, 2020/2021, 2021/2022
Second Semester
Course Code: **CVE 344**
Course Title: **Soil Mechanics**
Credit Units: **2 Units, Core, Lecture Hours 15, Practicals 45**

5. Lecturers Name: Engr. Dr. C.C. Ike and Engr. J.N. Ugwu
6. Phone Nos: +2348033101883, +2348034161148
3. Email: charles.ike@esut.edu.ng and juliet.ugwu@esut.edu.ng

4(i) Course contents:

Geostatic (overburden) stress distribution in soil. Boussinesq stress distribution theory. Vertical stress under circular foundation areas carrying uniformly distributed loads. Vertical stresses under rectangular foundation areas carrying uniformly distributed loads. Superposition principle and its application to find vertical stresses for irregular foundation shapes. Elastic settlement analysis. Henry Darcy's law of seepage. Equation of continuity for seepage. Determination of coefficient of permeability using constant head permeability test and falling load permeability test. Field methods for finding the coefficient of permeability. Dupuit's method for seepage through earth dams. Terzaghi's one-dimensional soil consolidation theory. Consolidation settlement analysis. Consolidation settlement analysis of clay soils. Analysis of slope stability by Bishop Method. Analysis of slope stability by ordinary method of slices. Applications of ordinary method of slices. Applications of Bishop's method of slope stability. Fellenius method, Janbu's method

4(ii) Course Learning outcomes

At the end of the course students should be able to:

1. Determine the geostatic stress distribution in soil due to the self weight of soil.
2. State Boussinesq stress distribution theory for point load on elastic half space.
3. Apply the Boussinesq stress distribution theory to determine vertical stress at any point in the elastic soil.
4. Extend Boussinesq stress distribution theory to find stresses in soil due to uniformly distributed loads over circular foundation areas.
5. Extend Boussinesq stress distribution theory to find stresses in soil due to uniformly distributed loads over rectangular foundation areas.
6. Use superposition principle to find stresses in soil due to uniformly distributed loads over irregular foundation shapes.
7. Perform elastic settlement analysis in soil.
8. State Henry Darcy's law of seepage
9. Derive continuity law of seepage
10. Analyse seepage in dams using Dupuit's method
11. Determine the coefficient of permeability of soil using laboratory and field methods
12. Derive Terzaghi's one-dimensional (1D) consolidation theory.
13. Perform consolidation settlement analysis
14. Analyse the stability of earth slopes.

5. Weeks and Days of Lectures

Week	Days	Period	Topics
1	Wednesday	9am-11am	Inception Quiz/Assignment. Introduction to mechanics.
2	Wednesday	9am-11am	Stress analysis. Boussinesq's theory.
3	Wednesday	9am-11am	Vertical stresses under rectangular and circular foundations.
4	Wednesday	9am-11am	Elastic settlement analysis.
5	Wednesday	9am-11am	Seepage
6	Wednesday	9am-11am	Laboratory and field methods of finding the

			permeability coefficient
7	Wednesday	9am-11am	Terzaghi's one dimensional consolidation theory.
8	Wednesday	9am-11am	Mid semester quiz/Assignment.
9	Wednesday	9am-11am	Consolidation settlement analysis
10	Wednesday	9am-11am	Analysis of slope stability. Bishops method.
11.	Wednesday	9am-11am	Ordinary method of slices
12	Wednesday	9am-11am	Ordinary method of slices
13	Wednesday	9am-11am	Fellenius method.
14	Wednesday	9am-11am	Fellenius method.
15	Wednesday	9am-11am	Janbu's method.

16. Office hours for students

Monday 9am-12noon, and Fridays 9am -12noon.

17. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Inception Quiz/ Assignment	**Mid-Semester Quiz Assignment**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents.

18. Model answers/ marking schemes of examinations
    Please find attached documents.
19. Samples of examination booklets/scripts.
    Please find attached documents.
20. A brief write-up on how the course learning could be improved.

Course learning could be improved with the use of good instructional materials and adequate laboratory equipment.

Academic Sessions 2020/2021 – 2021/2022,

Second Semester

Course Code: **CVE 334**

Course Title: **Construction Planning**

Credit Units: **2 Units, Core, Lecture Hours: 30**

1. Lecturers' Name: Engr. S. N. Ikwueze & Engr J Nnam

2. Phone No: +2348039462588 and +2349029231547

3. Email: stella.ikwueze@esut.edu.ng &John.nnam@esut.edu.ng

4(i) Course Contents

Introduction to planning in everyday life, planning techniques. Job activities, types of activities, assessing the duration of activities. Bar charts and linked bar charts. Job logic and restraints, events, time analysis. Network diagram, isolation of critical path, float and associated problems. Construction materials and equipment, quantity valuation, swell and shrinkage factor problems. Equipment fundamentals, outputs and production, Compaction and equipments.

Site layout and organization; setting out of buildings; Types and methods of construction of principal elements; types and electricity and water supply-internal external finishes.

4(ii) Course Learning Outcomes

At the end of the course, the students should be able to state/know:

1. Introduction to planning in everyday life, planning techniques.
2. Job activities, types of activities, assessing the duration of activities.
3. Bar charts and linked bar charts.
4. Job logic and restraints, events, time analysis.
5. Network diagram, isolation of critical path, float and associated problems.
6. Construction materials and equipment,
7. quantity valuation, swell and shrinkage factor problems.
8. Equipment fundamentals, outputs and production, Compaction and equipments.
9. Site layout and organization; setting out of buildings;
10. Types and methods of construction of principal elements;
11. Types and electricity
12. water supply-internal external finishes

5. Week and Days of Lectures

Week	**Days**	**Period**	**Lecture Topics**
1.	Friday	9am-11am	Introduction to planning in everyday life, planning techniques
2.	Friday	9am-11am	Job activities, types of activities, assessing the duration

			of activities
3.	Friday	9am-11am	Bar charts and linked bar charts
4.	Friday	9am-11am	Job logic and restraints, events, time analysis
5.	Friday	9am-11am	Network diagram, isolation of critical path, float and associated problems
6.	Friday	9am-11am	Construction materials and equipment
7.	Friday	9am-11am	quantity valuation, swell and shrinkage factor problems
8.	Friday	9am-11am	Equipment fundamentals,

			outputs and production, Compaction and equipments
9.	Friday	9am-11am	Site layout and organization; setting out of buildings
10.	Friday	9am-11am	Types and methods of construction of principal elements
11.	Friday	9am-11am	Types and electricity
12.	Friday	9am-11am	water supply-internal external finishes

6. Office hours for students

Tuesdays: 11am – 1:00pm, Thursdays: 10am – 1:00pm

Course Code: CVE 371

Course Title: Engineering Surveying 1

Engineering Surveying 1, Credit Unit: 2

Units, Core

Lecturer Hours: 3 Credit

1. Lecturers' Name: Engr. I. U. Nwafor and Engr. S. I. Ikwueze
2. Phone No: +2349033208312
3. Email: innocent.nwafor@esut.edu.ng
4. Office hours for student: Tuesday and Thursday

i. Course content:

Theory: Introduction to Geodesy Dymitions, basic Principles of surveying, types of survey, theory of Measurements and errors. chain surveying; levelling, compass and theodolite traversing, tachometry and hydrographic survey.

ii. **SCHEDULE FOR QUIZ, ASSIGNMENT AND EXAMINATIONS**

Assignment/quiz x	Quiz	Examination
Week 2	8 weeks	Week 15

Course learning outcome

1. At the end of this course outline the students should be able to know the Principles of measurements.
2. To tackle error and problems and obstacles in chain surveying
3. The students should be able to use rise and fall method, height of instrument to calculate the reduced levels.

Theodolite /compass

Apply traversing in issues of bearing and distances

Conclusion

The students needs more time for field work and practical than the 2hours stated for field work. Two doing away with analog and obsolete equipment will also expose the students to modern day surveying.

COURSE LEARNING OUTCOMES FOR CVE 341 PRACTICAL

Course Title: Engineering Geology I Practical

Technologist: Ifegbunam Nelson U.

Week days of Practical: Tuesdays

Course Content: Site Exploration and exampling, moisture content determination, specific gravity.

Weeks and Days of Practical

Weeks	**Days**	**Period**	**Topics**
1	Tuesday	3-5pm	Site Exploration and Sampling
2	Tuesday	3-5pm	Site Exploration and Sampling
3	Tuesday	3-5pm	Site Exploration and Sampling
4	Tuesday	3-5pm	Site Exploration and Sampling
5	Tuesday	3-5pm	Site Exploration and Sampling
6	Tuesday	3-5pm	Moisture Content Determination
7	Tuesday	3-5pm	Moisture Content Determination
8	Tuesday	3-5pm	Moisture Content Determination
9	Tuesday	3-5pm	Moisture Content Determination
10	Tuesday	3-5pm	Moisture Content Determination
11	Tuesday	3-5pm	Specific Gravity
12	Tuesday	3-5pm	Specific Gravity
13	Tuesday	3-5pm	Specific Gravity
14	Tuesday	3-5pm	Specific Gravity
15	Tuesday	3-5pm	Specific Gravity

COURSE LEARNING OUTCOMES FOR CVE 344 PRACTICAL

Course Title: Soil Mechanics Practical

Technologist: Ifegbunam Nelson U.

Week days of Practical: Fridays

Course Content:

Moisture content determination, specific gravity, particles size distribution, hydrometer analysis, liquid limit test, shrinkage limit test, compactor California Bearing ratio (CBR) test, permeability, consolidation test, traixial test

Weeks and Days of Practical

Weeks	**Days**	**Period**	**Topics**
1	Friday	12-2pm	Moisture content determination
2	Friday	12-2pm	Specific gravity
3	Friday	12-2pm	Particle size distribution
4	Friday	12-2pm	Hydrometer analysis
5	Friday	12-2pm	Liquid limit test
6	Friday	12-2pm	Shrinkage limit test
7	Friday	12-2pm	Compaction test
8	Friday	12-2pm	Compaction test
9	Friday	12-2pm	California Bearing Ratio (CBR)
10	Friday	12-2pm	California Bearing Ratio (CBR)
11	Friday	12-2pm	Permeability
12	Friday	12-2pm	Consolidation test
13	Friday	12-2pm	Consolidation test
14	Friday	12-2pm	triaxial test
15	Friday	12-2pm	triaxial test

COURSE LEARNING OUTCOMES FOR CVE 342 PRACTICAL

Course Title: Engineering Geology II Practical

Technologist: Ifegbunam Nelson U.

Week days of Practical: Tuesdays

Course Content:

Practical size distribution, liquid limit test, compaction test, consolidation test, triaxial test.

Weeks and Days of Practical

Weeks	**Days**	**Period**	**Topics**
1	Tuesday	3-5pm	Particle size distribution
2	Tuesday	3-5pm	Particle size distribution
3	Tuesday	3-5pm	Particle size distribution
4	Tuesday	3-5pm	Liquid limit test
5	Tuesday	3-5pm	Liquid limit test
6	Tuesday	3-5pm	Liquid limit test
7	Tuesday	3-5pm	Compaction test
8	Tuesday	3-5pm	Compaction test
9	Tuesday	3-5pm	Compaction test
10	Tuesday	3-5pm	Consolidation test
11	Tuesday	3-5pm	Consolidation test
12	Tuesday	3-5pm	Consolidation test
13	Tuesday	3-5pm	Triaxial test
14	Tuesday	3-5pm	Triaxial test
15	Tuesday	3-5pm	Triaxial test

Academic Sessions 2020/2021 – 2022/2023,

First Semester

Course Code: CVE 301

Course Title: Computer Application Software in Civil Engineering, Credit Units: 2 Units, Core

Lecture Hours: 30

1. Lecturers' Name: Engr. I. U Nwafor. and Engr. J. Nnam

2. Phone No: +2348037365140, and +2349033208312

3. Email: innocent.nwafor@esut.edu.ng, and john.nnam@esut.edu.ng

OBJECTIVES:
To introduce students to the Application of various Software in Civil Engineering Practice.

COURSE CONTENTS:

1. INTRODUCTION TO EXCEL IN CIVIL ENGINEERING 6

- Basics of Excel-Worksheet & Workbook, Data type, Formula, Built-in Function, Array Formula, Data Formatting, Error Message, Printing, Making Charts, Engineering Drawing, Visual Basic Applications.
- Excel Functions-Math & Trigonometry Functions, Logical Functions, Lookup Functions, Text Functions, Data Analysis Functions.
- Creating Macro-Function Procedure-Sub Procedure-Control Structures-User Defined Functions Problems-Structure of Programs-Chart Macro-Manipulations on Program steps

2. **INTRODUCTION TO AUTOCAD IN CIVIL ENGINEERING 6**

- **Introducing AUTOCAD 2007**- Opening AutoCAD 2007, The mouse as a digitizer, Palettes, Dialogs, Buttons in the status bar, The AutoCAD coordinate system, drawing templates, Method of showing entries in the command palette, Tools and tool icons.
- **Introducing drawing**-The 2D Classic AutoCAD workspace, drawing with the Line tool, drawing with the Circle tool, The Erase tool, Undo and Redo tools, Drawing with the

Polyline tool.

- **Osnap, AutoSnap and Draw tools**-The Arc tool, The Ellipse tool, saving drawings, Osnap, AutoSnap and Dynamic Input, Object Snaps (Osnaps), Using AutoSnap.
- Zoom, Pan and templates, The Aerial View window, The Pan tool, Drawing templates.
- The Modify tools, The Copy tool, The Mirror tool, The Offset tool, The Array tool, The Move tool, The Rotate tool, The Scale tool, The Trim tool, The Stretch tool, The Break tool, The Join tool, The Extend tool, The Chamfer and Fillet tools.
- Dimensions and Text, The Dimension tools, adding dimensions using the tools, Adding dimensions from the command line, Dimension tolerances, Text.
- Hatching, Block & Inserts.

3. INTRODUCTION TO MICROSOFT PROJECT PROFESSIONALS 6

- The MS Project Interface
- Basic Steps to Create a Project- Start a new project from a Start or Finish date- Add tasks, recurring tasks and Milestones-Creating WBS with Summary Tasks-Create Dependencies- Assign Resources-Find critical path & Close Project.
- Practical Applications.

4. INTRODUCTION TO STRUCTURAL ANALYSIS AND DESIGN SOFTWARE (STAAD PRO) 6

1. Main Steps of Modeling

- Entering job information.
- Building model geometry.
- Defining member properties, sections.
- Assigning loads (load cases, combinations.).
- Defining pre-analysis print out, analysis type,
- and post-analysis printout.
- Defining design requirements

OUTCOMES:

On completion of this course the students will be able to

- Understand the Application of Excel in Civil Engineering.
- Understand the Application of AUTOCAD in Civil Engineering.

- Understand the Application of Microsoft Project Professional for Project Planning in Civil Engineering.
- Understand the Application of Structural Analysis Software (STAAD) in Civil Engineering.

TEXT BOOKS:

- An Introduction to Excel for Civil Engineers, Gunthar Pangaribuan E-book.
- Getting started with Microsoft Project 2010.
- Introduction to AutoCAD 2007 2D and 3D Design, Alf Yarwood Gambhir.M.L., 2007
- Computer Analysis of Steel Structures by STAAD Prepared by Shah Alam., 2004

6. Office hours for students

Tuesdays: 9am – 12noon, Fridays: 9am – 12noon

7. Schedule for Quiz and Exams with Samples of Past Quiz and Examination Question Papers

Assignment/Quiz	**Mid Semester Quiz**	**Revision**
Week 5	Week 10	Week 15

Please find attached documents

8. Model Answer/Marking Schemes of Examinations

Please find attached documents

9. Samples of Examination Booklets/Scripts

Please find attached documents

10. **Recommendation for Improvement**

Course learning could be improved by using teaching aids like well-equipped Computer Design Studio.

Academic Sessions 2017/2018 – 2021/2022,

First Semester

Course Code: CVE 337

Course Title: Civil Engineering Materials Credit Units: 2 Units, Core

Lecture Hours: 30

1. Lecturers' Name: Engr. I. U Nwafor. and Engr. Dr. S. N. Ikwueze

2. Phone No: +2348037365140, and +2348039462588

3. Email: innocent.nwafor@esut.edu.ng, and stella.ikwueze@esut.edu.ng

OBJECTIVES:
To introduce students to various materials commonly used in civil engineering construction and their properties.

COURSE CONTENTS:

5. STONES – BRICKS – CONCRETE BLOCKS 6

Stone as building material– Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks –Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use –Refractory bricks – Cement, Concrete blocks – Lightweight concrete blocks.

6. **LIME – CEMENT – AGGREGATES – MORTAR 6**

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength –Tensile strength – Fineness– Soundness and consistency – Setting time – Industrial byproducts – Fly ash –Aggregates – Natural stone aggregates – Crushing strength – Impact strength –Flakiness Index – Elongation Index – Abrasion Resistance – Grading – Sand Bulking.

7. CONCRETE 6

Concrete – Ingredients – Manufacturing Process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction Factor Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proportioning – BIS method – High Strength Concrete and HPC – Self compacting Concrete –

Other types of Concrete – Durability of Concrete.

8. TIMBER AND OTHER MATERIALS 6

Timber – Market forms – Industrial timber– Plywood – Veneer – Thermacole – Panels of laminates –Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel –Uses – Market forms – Mechanical treatment – Paints – Varnishes Distempers – Bitumens.

9. MODERN MATERIALS 6

Glass– Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clayproducts– Refractories – Composite materials – Types – Applications of laminar composites– Fibre textiles– Geo-membranes and Geotextiles for earth reinforcement.

OUTCOMES:

On completion of this course the students will be able to

- Compare the properties of most common and advanced building materials.
- Understand the typical and potential applications of these materials.
- Understand the relationship between material properties and structural form.
- Understand the importance of experimental verification of material properties.

TEXT BOOKS:

- Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.
- Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
- Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and CompanyLtd.,2008.
- Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004

6. Office hours for students

Tuesdays: 9am – 12noon, Fridays: 9am – 12noon

7. Schedule for Quiz and Exams with Samples of Past Quiz and Examination Question Papers

Assignment/Quiz	**Mid Semester Quiz**	**Revision**
Week 5	Week 10	Week 15

Please find attached documents

8. Model Answer/Marking Schemes of Examinations

Please find attached documents

9. Samples of Examination Booklets/Scripts

Please find attached documents

10. **Recommendation for Improvement**

Course learning could be improved by using teaching aids like laboratory models.

Academic Sessions 2020/2021 – 2022/2023,

First Semester

Course Code: CVE 335

Course Title: Civil Engineering Drawing & Detailing, Credit Units: 2 Units, Core

Lecture Hours: 30

1. Lecturers' Name: Engr. I. U Nwafor. and Engr. J. Nnam

2. Phone No: +2348037365140, and +2349033208312

3. Email: innocent.nwafor@esut.edu.ng, and john.nnam@esut.edu.ng

OBJECTIVES:
To introduce students to the Application of AUTOCAD, ARCHICAD/REVIT and ORION in Civil Engineering Design, Drawings and Detailing.
COURSE CONTENTS:

10. **INTRODUCTION TO AUTOCAD IN CIVIL ENGINEERING 6**

- **Introducing AUTOCAD 2007**- Opening AutoCAD 2007, The mouse as a digitizer, Palettes, Dialogs, Buttons in the status bar, The AutoCAD coordinate system, drawing templates, Method of showing entries in the command palette, Tools and tool icons.
- **Introducing drawing**-The 2D Classic AutoCAD workspace, drawing with the Line tool, drawing with the Circle tool, The Erase tool, Undo and Redo tools, Drawing with the Polyline tool.
- **Osnap, AutoSnap and Draw tools**-The Arc tool, The Ellipse tool, saving drawings,

Osnap, AutoSnap and Dynamic Input, Object Snaps (Osnaps), Using AutoSnap.

- Zoom, Pan and templates, The Aerial View window, The Pan tool, Drawing templates.
- The Modify tools, The Copy tool, The Mirror tool, The Offset tool, The Array tool, The Move tool, The Rotate tool, The Scale tool, The Trim tool, The Stretch tool, The Break tool, The Join tool, The Extend tool, The Chamfer and Fillet tools.
- Dimensions and Text, The Dimension tools, adding dimensions using the tools, Adding dimensions from the command line, Dimension tolerances, Text.
- Hatching, Block & Inserts.

11. APPLICATION OF AUTOCAD TO CIVIL ENGINEERING DESIGN

- Preparation of Civil Engineering Working Drawings-Road Alignments, Profiles and Sections.
- Drafting & Detailing of Reinforced Concrete Structures-Buildings, Drainage Structures-Culverts, Retaining Walls, etc

12. APPLICATION OF ARCHICAD/REVIT TO CIVIL ENGINEERING DESIGN

- 3D Design and Modelling of Buildings.

13. APPLICATION OF ORION TO CIVIL ENGINEERING DESIGN

- Project Settings-Selection Methods, Zooming & Panning Methods, Defining Grids Pattern, Defining Materials, Creating Columns, Creating Beams, Creating Slabs.
- Generating a 3D view of the Model
- Building Analysis & Design-Column Design-Beam Design-Design Status-Quantity Extraction Tables-Reports.

OUTCOMES:

On completion of this course the students will be able to

- Prepare Civil Engineering Working Drawings using AUTOCAD Software.
- Complete 3D Designs and Modelling of Building using ARCHICAD or REVIT Software.

- Complete Building Analysis & Design Using ORION Software

TEXT BOOKS & REFERENCES:

- Introduction to AutoCAD 2007 2D and 3D Design, Alf Yarwood Gambhir.M.L., 2007
- ArchiCAD version 7.0 Step by Step Tutorial by Thomas M. Simmons
- Orion Quick Start Guide by CSC ORION training.com

6. Office hours for students

Tuesdays: 9am – 12noon, Fridays: 9am – 12noon

7. Schedule for Quiz and Exams with Samples of Past Quiz and Examination Question Papers

Assignment/Quiz	**Mid Semester Quiz**	**Revision**
Week 5	Week 10	Week 15

Please find attached documents

8. Model Answer/Marking Schemes of Examinations

Please find attached documents

9. Samples of Examination Booklets/Scripts

Please find attached documents

10. **Recommendation for Improvement**

Course learning could be improved by using teaching aids like well-equipped Computer Design Studio.

Course Code	**CVE 331**
Course Title	**Strength of materials II**
Credit Units	**2 Units, Core Course, Lecture week 15**
1. Lecturer's Names	**Engr. Mrs .J .N Ugwu and Dr .J .I Enem**
2. Phone Numbers	**08034161148; 08036842738**
3. E-Mail Addresses	**juliet.ugwu@esut.edu.ng; johnmartins.enem@esut.edu.ng**

4. Course Contents

The differential equation of the elastic curve; the differential equation of the elastic curve of a beam, displacements in bending. General Equations of the Elastic curve of simple beams and cantilevers with arbitrary loadings; Method of superposition, slopes and deflection method and three moments method (Clapeyrons methods) in the analysis of continuous indeterminate beam. Displacements in a beam under arbitrary loading; potential energy of a beam in the general case of loading; Castigliano's theorem; Mohr's Integral, Verruschagin's Method and Betti's reciprocal theorem; introduction to theory of thin-walled structures with open profile; Vlasov's differential equations of equilibrium Boundary conditions and various methods of solution.

5. **Learning Outcome**

At the end of this course, the student should be able to:

- Understand deflections and slopes in beams

- Understand and derive the differential equation of the elastic curve of a beam and its importance.
- Understand and derive the general equations of the elastic curve of determinate simple beams and cantilever with arbitrary loadings.
- Estimate deflections and slopes in beams
- Understand and apply macaulay's method, clapeyron's theorem, slope-deflection method, moment distribution method, method of consistent deformation, area moment method in analysis of continuous indeterminate beams.
- Understand potential energy of a beam in the general case of loading, Castigliano's theorem, Betti's reciprocal theorem
- Understand the theory of thin walled structures

6. Week and days of lectures

Week	Days	Period	Topics	Learning outcome
1	Friday	9am -11am	Introduction to deflections and slopes in beams	Student should be able to understand deflections and slope in beams and their significance.
2	Friday	9am -11am	Introduction to deflections and slopes in beams	Student should be able to derive the differential equation of the elastic line and use it to determine deflections and slopes in beams using the methods of double integration, macaulay, moment area.
3	Friday	9am -11am	Introduction to deflections and slopes in beams	Student should be able to derive the differential equation of the elastic line and use it to determine deflections and slopes in beams using the methods of double integration, macaulay, moment area.
4	Friday	9am -11am	Introduction to deflections and slopes in beams. Analysis of indeterminate beams.	Student should be able to derive the differential equation of the elastic line and use it to determine deflections and slopes in beams using the methods of double integration, macaulay, moment area.

5	Friday	9am -11am	Analysis of indeterminate beams	Student should be able to analyse an indeterminate beam using; macaulay, three moment method, moment area method, moment distribution , slope deflection, consistent deformation methods
6	Friday	9am -11am	Analysis of indeterminate beams	Student should be able to analyse an indeterminate beam using; macaulay, three moment method, moment area method, moment distribution , slope deflection, consistent deformation methods
7	Friday	9am -11am	Analysis of indeterminate beams	Student should be able to analyse an indeterminate beam using; macaulay, three moment method, moment area method, moment distribution , slope deflection, consistent deformation methods
8	Friday	9am -11am	Mid-semester quiz and assignment	First assessment on topics done so far
9	Friday	9am -11am	Analysis of indeterminate beams	Student should be able to analyse an indeterminate beam using; macaulay, three moment method, moment area method, moment distribution , slope deflection, consistent deformation methods
10	Friday	9am -11am	Strain energy	Student should be able to understand the strain energy method
11	Friday	9am -11am	Strain energy	Student should be able to understand the strain energy method and the energy theorem
12	Friday	9am -11am	Strain energy	Student should be able to understand the energy theorem, castigliano's theorem, Betti's theorem for deflections.
13	Friday	9am -11am	Strain energy and Theory of thin walled	Student should be able to understand the energy theorem, castigliano's theorem, Betti's theorem for deflections.

			structure	
14	Friday	9am -11am	Theory of thin walled structure	Student should understand the theory of thin walled structures
15	Friday	9am -11am	Theory of thin walled structure and General Revision	Student should understand the theory of thin walled structures. General revision and second assessment.

7. Office Hours for Students

Wednesday 1pm - 3pm and Friday 11am – 2pm

8. Schedule for Quiz and Exams

Inception Assignment	Mid-Semester Quiz and Assignment	Revision
Week 1	Week 8	Week 15

9. Model answers/ marking schemes of examinations
Please find attached documents

10. Samples of examination booklets
Please find attached documents

11. A brief write-up on how the course learning could be improved
Course learning could be improved with the use of good instructional materials and adequate laboratory equipment.

Academic Sessions: 2017/2018, 2018/2019, 2019/2020, 2020/2021, 2021/2022
Second Semester
Course Code: **CVE 351**
Course Title: **Fluid Mechanics and hydraulics**
Credit Units: **3 Units, Core, Lecture Hours 20, Practicals 40**

7. Lecturers Name: Engr. Dr. C. Odenigbo
8. Phone Nos: +2347033735542
3. Email: Celestine.odenigbo@esut.edu.ng

1. **Course Outlines:**

Fluid fundamentals: definitions, units, dimensions. Fluid statics, fluid pressure manometer, fluid thrust on immersed plane surfaces and on immersed curved surfaces; stability of floating and submerged bodies-density, vapour, pressure, viscosity and surface tension of fluids. Fluid measurement: pitot and pitot- static tubes, orifices, nozzles,

venturimeters, weirs and notches. Real fluid flow, Reynolds's experiment, laminar and turbulent, velocity distribution. Laminar flow between parallel plates, through circular tubes, boundary layers and separation.

2. Learning outcomes

i. The main scope of fluid mechanics and its important applications is to offer basic knowledge on fluid statics, dynamics and hydraulic machines. It will further generate appropriate man power that can combat different challenges associated withwater pumps and hydraulic machines in our local environment Enugu state.

ii. To understand the laws of fluid mechanics.
iii. To evaluate pressure, velocity and acceleration of various fluids flow.
iv. To evaluate the performance characteristics of turbine and pumps.
v. To identify the importance of various fluid properties at rest and in transit.
vi. To derive and apply general governing equations for various fluid flows.
vii. Solve problems involving fluid properties and shear forces fromNewtonian fluids.
viii. Calculate the magnitude and location of hydrostatic forces on flat plates and curved surfaces immersed in a static fluid.
ix Analyze fluid systems using the integral form of the continuity,momentum, impulse momentum and energy equation.
ix. Measure velocity and fluid flow rates using flow measuring devices.

4. Weeks and Days of Lectures

Week	Days	Period	Topics
1	Tuesday	9am-11am	Fluid fundamentals: definitions, units, dimensions. Fluid statics.
2	Thursday	11am-1pm	fluid pressure manometer
3	Tuesday	9am-11am	fluid thrust on immersed plane surfaces and on immersed curved surfaces
4	Thursday	11am-1pm	stability of floating and submerged bodies-density.
5	Tuesday	9am-11am	vapour, pressure, viscosity and surface tension of fluids
6	Thursday	11am-1pm	pitot and pitot- static tubes, orifices, nozzles, venturimeters, weirs and notches
7	Tuesday	9am-11am	Real fluid flow, Reynolds's experiment, laminar and turbulent
8	Thursday	11am-1pm	velocity distribution
9	Tuesday	9am-11am	Laminar flow between parallel plates, through circular tubes
10	Thursday	11am-1pm	Hydraulics of wells
11.	Tuesday	9am-11am	Boundary layers and separation
12	Thursday	11am-1pm	Boundary layers and separation
13	Tuesday	9am-11am	Tutorials
14	Thursday	11am-1pm	Tutorials
15	Tuesday	9am-11am	Tutorials

5. Office hours for students

Wednesday 11am-12noon, and Fridays 11am -1pm.

6. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Inception Quiz/ Assignment	Mid-Semester Quiz Assignment	Revision
Week 1	Week 8	Week 16

Please find attached documents.

7. Model answers/ marking schemes of examinations
   Please find attached documents.
8. Samples of examination booklets/scripts.
   Please find attached documents.

   Course learning can improve through tutorial and laboratory experiments

Course Tittle: Engineering Geology II
Lecturer's Name: Dr. D. C. Ugwuanyi
Phone Nos: 08073594376[1]
E-mail Addresses: donald.ugwuanyi@esut.edu.ng[1]
Week day/s of Lectures: Thursdays
Office Hours for Students: 12:00 – 2:00 pm on Tuesdays and Thursdays

Course Content
Rock-soil cycle; chemical composition of soil/clay. Mineralogy phase relationship: specific gravity of the soil, grain size distribution; plasticity, soil structure and theory of compaction, shear resistance of soil, strength conditions; soil testing; stability of slopes, landslides; retaining walls, creep and settlement of foundation; site exploration of buildings, highways. Airport, bridges, dam sites; compressibility and shear strength.

Schedules for Quiz, Assignment and Examination (please fine attached documents)

Assignment/Quiz	**Quiz**	**Examination**
Week 5	Week 10	Week 15

Recommendation for Improvement
In addition to strict adherence to the schedules and procedures already stated, congenial and innovative approach should be verified and adopted if it has merits.

COURSE TITLE: CIVIL ENGINEERING MATERIALS PRACTICAL
COURSE CODE: CVE 337

TECHNOLOGIST: ENGR. EZE CHINONSO EMMANUEL
WEEK DAYS OF PRACTICAL: THURSDAYS

Course contents: Introduction to civil engineering materials tools and equipment, silt test and impurity test/organic test, site sampling of materials/labeling, quartering of samples, washing of samples/drying, sieve analysis of fine aggregate, sieve analysis of coarse aggregate, specific gravity of fine aggregate, specific gravity of coarse aggregate, bulk density test, impact crushing value, aggregate crushing value, angularity test/texture, abrasion test, method of reporting lab work and submission of practical work.

Weeks	Days	Period	Topics
1	Thursdays	1-3pm	Introduction to civil engineering materials tools and equipment
2	Thursdays	1-3pm	Silt test and impurity test/organic test
3	Thursdays	1-3pm	Site sampling of materials/labeling
4	Thursdays	1-3pm	Quartering of samples
5	Thursdays	1-3pm	Washing of samples/drying
6	Thursdays	1-3pm	Sieve analysis of fine aggregate
7	Thursdays	1-3pm	Sieve analysis of coarse aggregate
8	Thursdays	1-3pm	Specific gravity of fine aggregate
9	Thursdays	1-3pm	Specific gravity of coarse aggregate
10	Thursdays	1-3pm	Bulk density test
11	Thursdays	1-3pm	Impact crushing value
12	Thursdays	1-3pm	Aggregate crushing value
13	Thursdays	1-3pm	angularity test/texture

14	Thursdays	1-3pm	Abrasion test and Method of reporting lab work
15	Thursdays	1-3pm	Submission of practical work.

COURSE TITLE: CONCRETE TECHNOLOGY PRACTICAL
COURSE CODE: CVE 338
TECHNOLOGIST: ENGR. EZE CHINONSO EMMANUEL
WEEK DAYS OF PRACTICAL: THURSDAYS

Course contents: Introduction of materials for Concrete, introduction to binding agent (cement), grading of aggregate/sampling, introduction to cement test, setting time test of cement, soundness test, fineness test of cement, zoning of fine aggregate, grading of concrete, mix design calculation, casting of concrete cubes/slump test, curing of concrete cubes, introduction to compressive machine/cube test, method of reporting lab work and submission of practical work.

Weeks	**Days**	**Period**	**Topics**
1	Thursdays	1-3pm	Introduction of materials for Concrete
2	Thursdays	1-3pm	introduction to binding agent (cement)
3	Thursdays	1-3pm	Grading of aggregate/sampling
4	Thursdays	1-3pm	Introduction to cement test
5	Thursdays	1-3pm	Setting time test of cement
6	Thursdays	1-3pm	Soundness test
7	Thursdays	1-3pm	Fineness test of cement
8	Thursdays	1-3pm	Zoning of fine aggregate
9	Thursdays	1-3pm	Grading of concrete

10	Thursdays	1-3pm	Mix design calculation
11	Thursdays	1-3pm	Casting of concrete cubes/slump test
12	Thursdays	1-3pm	Curing of concrete cubes
13	Thursdays	1-3pm	Introduction to compressive machine/cube test
14	Thursdays	1-3pm	Method of reporting lab work
15	Thursdays	1-3pm	Submission of practical work.

Course Title: STATISTICAL METHODS IN CIVIL ENGINEERING (CVE 401)
Lecturer's Name: Amulu Chijioke P
Phone number: 08062436643
E-mail: amuluchijioke@gmail.com
Course Content:

Introduction to fundamentals of probability for civil engineering; Statistical methods and data analysis in civil engineering; Elementary probability in civil engineering; Sampling distributions in civil engineering; Inference, Testing Hypothesis and estimation in civil engineering; Normal, Binomial and Poisson's distribution applied to civil engineering; One-way analysis in civil engineering

Week Days of Lectures:

Tuesdays: 1 – 3pm
Thursdays: 9 – 11am

Office Hours for Students: 11 – 1pm Wednesdays and Fridays
Schedules for Quiz, Assignment and Examination (please find attached documents)

Assignment/Quiz	**Assignment**	**Revisions/ Quiz**	**Examination**
Week 5	Week 10	2 Weeks before Exams	Week 15

Recommendation for Improvement:

The introduction of computer aided programming like Excel technique, SPSS, Minitab etc will equip the students with the required cognitive knowledge and skills in designing experiments, and demonstrating, in practical terms, all they have learnt in class. It will enhance the performance of the students.

Course Title: ANALYSIS AND COMPUTATION (CVE 435)
Lecturer's Name: Amulu Chijioke P
Phone number: 08062436643
E-mail: amuluchijioke@gmail.com
Course Content:

Matrix methods of structural analysis; Engineering analysis and computation with Ms Excel; MatLab techniques of linear and non-linear equations; Computer aided design and drafting using AutoCAD, Civil soft and quick-struct packages in structural computations

Week Days of Lectures:

Tuesdays: 3 – 5pm
Fridays: 9 – 11am

Office Hours for Students: 11 – 1pm Wednesdays and Fridays
Schedules for Quiz, Assignment and Examination (please find attached documents)

Assignment/Quiz	**Assignment**	**Revisions/ Quiz**	**Examination**
Week 5	Week 10	2 Weeks before Exams	Week 15

Recommendation for Improvement:

The computer aided design should be on application to analyze using Matlab or QBasic, for instance and not for drafting alone. Course contents like interpolating polynomial, should be added to equip students with the knowledge of determining approximation to derivatives and integrals of certain functions.

ACADEMIC SESSIONS: 2017/2018, 2018/2019; 2020/2021, 2021/2022
FIRST SEMESTER

Course Code: **CVE 443**
Course Title: **Soil Engineering**
Credit Units: **3 Units, Core, Lecturer Hours 45**

1. Lecturers Name: Engr. Dr. C.C. Ike, and Engr. Dr. D.C. Ugwuanyi
2. Phone Nos: +2348033101883, and +2348073594376
3. Email: charles.ike@esut.edu.ng, and donald.ugwuanyi@esut.edu.ng

4(i) Course contents:

Introduction to foundations/ footings. Shallow foundations. Deep foundations. Two types, two functions and two uses of shallow foundations. Pad footings. Combined foundations/footings. Strip footings/foundations. Raft (mat) footings. Two considerations in footing design/selection. Conceptual framework of bearing capacity analysis as stability problems. Terzaghi's bearing capacity theory for strip footings. Terzaghi's theory for rectangular and circular footings. Meyerhoff's bearing capacity theory. Brinch Hansen's theory. Vesic's bearing capacity theory. Prandtl's bearing capacity theory. Application of various bearing capacity theories in the determination of ultimate bearing capacity. The determination of net ultimate bearing capacity. Determination of allowable bearing capacities of footings. Proportioning of footings for settlement. Proportioning of footings for allowable bearing capacity. Geotechnical design of footings. Soil investigation. Soil investigation report.

4(ii) Course Learning outcomes

At the end of the course, the students should be able to:

1. List two broad types of foundations and explain two basic functions of foundations.
2. List and explain types of shallow foundations and two uses of shallow footings.
3. Explain the conceptual/theoretical basis of the bearing capacity theory.
4. Derive Terzaghi's bearing capacity theory for strip footings and rectangular footings
5. State Meyerhoff's bearing capacity theory.
6. Present Brinch Hansen's, Vesics and Prandtl's bearing capacity theories.
7. Calculate the ultimate bearing capacity and net ultimate bearing capacities and allowable bearing capacities of soil using Terzaghi's, Meyerhoff's, Brinch Hansen's, Vesics and Prandtl's bearing capacity theories.
8. Proportion/size or dimension various footings using settlement as criterion, and using allowable bearing capacity as criterion.
9. Do geotechnical design of footings
10. Do soil investigation studies.

5. Weeks and Days of Lectures

Week	Days	Period	Topics
1	Wednesday	9am-11am	Inception Quiz/ Assignment. Introduction to foundation Engineering. Types and uses of foundations.
2	Wednesday	9am-11am	Ultimate Bearing capacity. Net ultimate bearing capacity.
3	Wednesday	9am-11am	Terzaghi's bearing capacity theory for rectangular and circular footings
4	Wednesday	9am-11am	Meyerhoff bearing capacity theory. Brinch Hansen, Prandtl, Vesic's bearing capacity theories.
5	Wednesday	9am-11am	Determination of ultimate bearing capacity and net ultimate bearing capacity.
6	Wednesday	9am-11am	Allowable bearing capacity of footings. sizing of footings for settlement considerations.
7	Wednesday	9am-11am	Footing sizing analysis examples.

8	Wednesday	9am-11am	Mid semester quiz/ assignment.
9	Wednesday	9am-11am	Proportioning of footings for allowable bearing capacity.
10	Wednesday	9am-11am	Proportioning of footings for allowable bearing capacity.
11.	Wednesday	9am-11am	Proportioning of footings for allowable bearing capacity.
12	Wednesday	9am-11am	Geotechnical design of footings/Soil investigation studies of ESUT soil.
13	Wednesday	9am-11am	Geotechnical design of footings/Soil investigation studies of ESUT soil.
14	Wednesday	9am-11am	Geotechnical design of footings/Soil investigation studies of ESUT soil.
15	Wednesday	9am-11am	Geotechnical design of footings/Soil investigation studies of ESUT soil.

21. Office hours for students

Monday 9am-12noon, and Fridays 9am -12noon

22. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Inception quiz/ assignment	**Mid-semester quiz assignment**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents.

23. Model answers/ marking schemes of examinations
    Please find attached documents.
24. Samples of examination booklets/ scripts.

Please find attached documents.

25. A brief write-up on how the course learning could be improved.

Course learning could be improved by visits to construction sites of foundations.

Academic Sessions: 2017/2018, 2018/2019, 2019/2020, 2020/2021, 2021/2022
Second Semester
Course Code: **CVE 541**
Course Title: **Dynamics and Stability of Structures**
Credit Units: **2 Units, Core Lecture Hours 30**

9. Lecturers Name: Engr. Dr. C.C. Ike and Engr. Dr. J.I. Enem
10. Phone Nos: +2348033101883, +2348036842738
3. Email: charles.ike@esut.edu.ng and johnmartins.enem@esut.edu.ng

4(i) Course contents:

Define dynamic forces. Sources of dynamic loads. Mathematical representations of dynamic forces. Concept of degree of freedom of dynamic structures. Free vibrations. Forced vibrations. Damped vibration. Un-damped vibration. Idealizing dynamic structures as single (one) degree of degree of freedom (SDOF or 1DOF) structures. 2DOF vibrating systems. Multiple degree of freedom (MDOF) vibrating structures. Lumped parameter SDOF dynamic structures. Equations of motion of SDOF systems by D'Alembert's principle for un-damped vibration. Equation of motion of SOF systems for damped vibration. Solving equation of motion of SDOF dynamic structures for damped vibration. Applications to axial structures (bars). Applications to bending structures (beams). Solving equations of motion of SDOF dynamic structures for damped vibration. Euler's differential equation for column stability. Critical loads evaluation.

4(ii) Course Learning outcomes

At the end of the course students should be able to:

i. Define dynamic forces.
ii. Determine the degree of freedom of dynamic structures.
iii. Define free vibration, forced vibration and differentiate between free and forced vibration.
iv. Define damped vibration, un-damped vibration and differentiate between damped vibration and un-damped vibration.
v. State two illustrative examples of SDOF, illustrate two examples of 2DOF and two examples of MDOF vibrating structures.
vi. Use mass-spring-dashpot dumped parameter model to represent vibrating bars, beams and frames.
vii. Derive the equation of motion of vibrating bars, beams and frames using SDOF lumped parameter modeling.
viii. Solve the equations of motion to find the displacement-time response and internal stresses, for critically damped under-damped and over-damped vibrations.
ix. Derive the Euler's differential equation for column stability.
x. Determine the critical loads for various boundary conditions.
xi. Analyse the stability of frames, arches and rings.

5. Weeks and Days of Lectures

Week	**Days**	**Period**	**Topics**
1	Thursday	9am-11am	Introduction to dynamics and stability of structures; Define dynamic forces
2	Thursday	9am-11am	Determine the degree of freedom of dynamic structures
3	Thursday	9am-11am	Free vibration, forced vibration and differentiating between free and forced vibration.
4	Thursday	9am-11am	Damped vibration, un-damped vibration and differentiating between damped vibration and un-damped vibration.
5	Thursday	9am-11am	Dynamic of single degree of freedom(SDOF) structures

6	Thursday	9am-11am	Dynamic of single degree of freedom(SDOF) structures
7	Thursday	9am-11am	Dynamic of single degree of freedom(SDOF) structures
8	Thursday	9am-11am	Mid semester quiz/Assignment.
9	Thursday	9am-11am	Dynamic of multiple degree of freedom(MDOF) structures
10	Thursday	9am-11am	Dynamic of multiple degree of freedom(MDOF) structures
11.	Thursday	9am-11am	Dynamic of multiple degree of freedom(MDOF) structures
12	Thursday	9am-11am	Dynamic of multiple degree of freedom(MDOF) structures
13	Thursday	9am-11am	Energy method
14	Thursday	9am-11am	Energy method
15	Thursday	9am-11am	Energy method

26. Office hours for students

Tuesday 9am-12noon, and Thursday 9am -12noon.

27. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Assignment	**Mid-Semester Quiz Assignment**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents.

28. Model answers/ marking schemes of examinations
    Please find attached documents.
29. Samples of examination booklets/scripts.
    Please find attached documents.
30. A brief write-up on how the course learning could be improved.

COURSE LEARNING OUTCOMES FOR CVE 501

Course Tittle: Civil Engineering Research Methods
Lecturers Names: Dr. D. C. Ugwuanyi[1] and Dr. P. N. Onuamah[2]
Phone Nos: 08073594376[1] and 0803342106[2]
E-mail Addresses: Donald.ugwuanyi@esut.edu.ng[1] and ponuamah@yahoo.co.uk[2]
Week day/s of Lectures: Mondays
Office Hours for Students: 12:00 – 2:00 pm on Tuesdays and Thursdays

Course Content
Introduction to civil engineering research methods, background of study, statement of problems, aim and objectives of study, significance of study, scope of study, limitations of study, literature review, literature search technique and reference tools, materials and methods, design of experiment, questionnaire design, methodology, modeling, optimization techniques, results and discussion, conclusion, recommendation, contribution to knowledge, publication of research paper.

Schedules for Quiz, Assignment and Examination (please fine attached documents)

Assignment/Quiz	Quiz	Examination
Week 5	Week 10	Week 15

Recommendation for Improvement
In addition to strict adherence to the schedules and procedures already stated, congenial and innovative approach should be verified and adopted if it has merits.

Course Code: CVE 562

Course Title: HIGHWAY AND TRANSPORTATION ENGINEERING II

Engineering Surveying 1, Credit Unit: 2

Units, Core

Lecture Hours: 3 Credit

5. Lecturers' Name: Engr. I. U. Nwafor and Engr. S. I. Ikwueze
6. Phone No: +2349033208312
7. Email: innocent.nwafor@esut.edu.ng
8. Office hours for student: Tuesday and Friday

Course contents

Introduction to design and maintenance of pavement, highway drainage and drainage structure, Erosion offside slopes and prevention. Practical design project, Highway materials, stones, Bituminous materials, subgrade soil.

Assignment/quiz	Quiz	Examination
Week 2		

Week 4 Week 6	Weeks 8	Week 15

Course learning outcome

1. The students will be able to know and understand the designing, construction and maintenance of highway road pavement (both rigid and flexible)
2. An indept course of pavement failure and ways of preventing them. The student will equally have an overall view of causes of erosion on the highway and preventive measures to tackle them.
3. The course will afford the student the opportunity of experimenting with various highway materials such as Bitumen, graintes soil for subgrade, cement and other material.

Conclusion:

Adequate funding of highway laboratories and field exploration/Excursion for students offering this course will be of a great advantage toward understanding and achieving greater success in this course.

Academic Sessions: 2017/2018, 2018/2019, 2019/2020, 2020/2021, 2021/2022
Second Semester
Course Code: CEV 546
Course Title: Design of Timber Structures

Credit Units: 2 Units, Core Lecture Hours 30

11. Lecturers Name: Engr. Dr. J.I. Enem and Engr. E.U. Ikwueze
12. Phone Nos: +2348036842738, +2348064834277
3. Email: johnmartins.enem@esut.edu.ng

4(i) Course contents:

Structural properties of natural wood; classification of structural timber; glued laminated timber and plywood; seasoning, preservation and fire-resistance; design of beams. Columns and diaphragms, timber connectors; application in buildings, electric poles, bridges and form work for concrete. Limit state philosophy in timber. Design parameters in timber. Elastic methods of design in timber. . The laboratory tests on Nigerian Timber Species including Compression parallel to grain. Test for Compression perpendicular grain. Classification of Timber species through density and moisture content

4(ii) Course Learning outcomes

At the end of the course students should be able to:

i. Understand and explain the properties of timber.
ii. Explain the strength properties of Nigeria timber.
iii. Explain the defect and preservation seasoning .
iv. Explain the limit state function in timber structures.
v. Understand the analysis of timber structural element.
vi. Understand and design Compression members-columns.
vii. Understand the analysis and design of Timber roof trusses

5. Weeks and Days of Lectures

Week	Days	Period	Topics
1	Friday	11am-1pm	Introduction to design of timber structures
2	Friday	11am-1pm	Properties of timber
3	Friday	11am-1pm	Properties of timber
4	Friday	11am-1pm	Strength properties of Nigerian timber

5	Friday	11am-1pm	Strength properties of Nigerian timber
6	Friday	11am-1pm	Modification factors
7	Friday	11am-1pm	Analysis of timber structural elements
8	Friday	11am-1pm	Mid semester quiz/Assignment.
9	Friday	11am-1pm	Analysis of timber structural elements
10	Friday	11am-1pm	Analysis of timber structural elements
11.	Friday	11am-1pm	Compression members-columns
12	Friday	11am-1pm	Compression members-columns
13	Friday	11am-1pm	Timber roof trusses
14	Friday	11am-1pm	Timber roof trusses
15	Friday	11am-1pm	Timber for bridges

31. Office hours for students

Tuesday 9am-12noon, and Thursday 9am -12noon.

32. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Assignment	**Mid-Semester Quiz Assignment**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents.

33. Model answers/ marking schemes of examinations
Please find attached documents.
34. Samples of examination booklets/scripts.
Please find attached documents.
35. A brief write-up on how the course learning could be improved.

Course learning could be improved with the use of good instructional materials and adequate laboratory equipment.

Academic Sessions: 2017/2018, 2018/2019, 2019/2020, 2020/2021, 2021/2022
Second Semester
Course Code: **CVE 552**
Course Title: **Water Resources Engineering**
Credit Units: **2 Units, Core, Lecture Hours 15, Practicals 45**

13. Lecturers Name: Engr. Dr. C. Odenigbo
14. Phone Nos: +2347033735542
3. Email: Celestine.odenigbo@esut.edu.ng

Course Outlines:

Planning and management of water resource projects, river basins and watersheds; ground water resources; hydraulics of wells; surface water development; irrigation principles and practice. Turbomachines – pumps and turbines. Similarity rules, pump characteristics/performance curves; capitation. Design pumping mains and gravity mains; service reservoirs; specific water treatment processes; environmental impact analysis.

Learning outcomes:

1. The skills obtain from the program may assist civil engineers involve in designing water purification, creating new equipment for contaminant transport when water is used for irrigation purposes in our local environment. It will also reposition the civil engineer towards adequate and proper water scheme in Enugu.

ii. Understand the water security including safety plan.
iii. Digitalize the water distribution system.
iv Manage water utilities.

v. Plan, operate, and manage water resource.
vi. Regulate water resource and management scheme.

vii. The program will be able to produce engineers with competence skill in planning, designing and management of Enugu water scheme.

5. Weeks and Days of Lectures

Week	Days	Period	Topics
1	Thursday	9am-11am	Planning and management of water resource projects.
2	Thursday	9am-11am	ground water resources
3	Thursday	9am-11am	Irrigation principles and practice
4	Thursday	9am-11am	Turbomachines – pumps and turbines.
5	Thursday	9am-11am	Similarity rules, pump characteristics/performance curves; capitation
6	Thursday	9am-11am	Design pumping mains and gravity mains
7	Thursday	9am-11am	Service reservoirs
8	Thursday	9am-11am	Specific water treatment processes
9	Thursday	9am-11am	Environmental impact analysis
10	Thursday	9am-11am	Hydraulics of wells
11.	Thursday	9am-11am	e water development
12	Thursday	9am-11am	Surface water development
13	Thursday	9am-11am	Tutorials
14	Thursday	9am-11am	Tutorials
15	Thursday	9am-11am	Tutorials

36. Office hours for students

Wednesday 11am-12noon, and Fridays 11am -1pm.

37. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Inception Quiz/ Assignment	**Mid-Semester Quiz Assignment**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents.

38. Model answers/ marking schemes of examinations
Please find attached documents.
39. Samples of examination booklets/scripts.
Please find attached documents.
40. A brief write-up on how the course learning could be improved.

Course learning could be improved with the use of Tutorials materials and adequate laboratory equipment.

Academic Sessions: 2017/2018, 2018/2019, 2019/2020, 2020/2021, 2021/2022
Second Semester
Course Code: CVE 537
Course Title: Advanced Structural Analysis
Credit Units: 2 Units, Core Lecture Hours 30

15. Lecturers Name: Engr. Dr. J.I. Enem and Engr. E.U. Ikwueze
16. Phone Nos: +2348036842738, +2348064834277
3. Email: johnmartins.enem@esut.edu.ng

4(i) Course contents:

Analysis of uniaxial and biaxial bending on short columns, transformation of eccentric columns loads into axial load and bending. Analysis of bucking and stability in beams, columns and struts. Euler critical load of slender columns and struts. Energy methods in structural analysis,

strain energy and complementary energy determination in structural members under load. Principle of real work and virtual work. Castigliano's theorem. Application of energy methods in the determination of deformation (slopes, deflection, sidesways) in the determinate beams, frames, trusses. Application of energy methods in the analysis of indeterminate beams, frames and trusses.

4(ii) Course Learning outcomes

At the end of the course students should be able to:

i. Understand and Explain the column, struts and their properties
ii. Explain the meaning of direct load, uniaxial and biaxial bending
iii. Understand, explain and formulate formulas for buckling of struts
iv. Understand, explain and formulate formulas for beam under bending
v. Understand the principles of energy method
vi. To formulate the theory and derivation for the method of real work.
vii. To formulate the theory and derivation for the method of virtual work
viii. To understand the principles of castigiliano's theorem

5. Weeks and Days of Lectures

Week	Days	Period	Topics
1	Thursday	3pm-5pm	Introduction to Advanced Structural Analysis.
2	Thursday	3pm-5pm	Column and Structs; Eccentrically loaded short columns; Direct load and Bi-axial bending.
3	Thursday	3pm-5pm	Buckling of structs
4	Thursday	3pm-5pm	Beam under bending
5	Thursday	3pm-5pm	Introduction to Energy method
6	Thursday	3pm-5pm	Strain Energy due to direct load and Strain Energy due to shear
7	Thursday	3pm-5pm	Strain Energy due to bending and Strain Energy due to torsion
8	Thursday	3pm-5pm	Mid semester quiz/Assignment.
9	Thursday	3pm-5pm	Method of real work

10	Thursday	3pm-5pm	Method of real work
11.	Thursday	3pm-5pm	Method of virtual work
12	Thursday	3pm-5pm	Method of virtual work
13	Thursday	3pm-5pm	Castigliano's theorem
14	Thursday	3pm-5pm	Castigliano's theorem
15	Thursday	3pm-5pm	Torsion

41. Office hours for students

Tuesday 9am-12noon, and Thursday 9am -12noon.

42. Schedules for Quiz and Exams with samples of past quiz and examinations question papers.

Assignment	**Mid-Semester Quiz Assignment**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents.

43. Model answers/ marking schemes of examinations
Please find attached documents.
44. Samples of examination booklets/scripts.
Please find attached documents.
45. A brief write-up on how the course learning could be improved.

Course learning could be improved with the use of good instructional materials and adequate laboratory equipment.

Academic Sessions 2020/2021 – 2021/2022,

Second Semester

Course Code: **CVE 535**

Course Title: **Construction Management II**

Credit Units: **2 Units, Core, Lecture Hours: 30**

1. Lecturers' Name: Engr. S. N. Ikwueze & Engr I. U. Nwafor

2. Phone No: +2348039462588 and +2348037365140

3. Email: stella.ikwueze@esut.edu.ng & innocent.nwafor@esut.edu.ng

4(i) Course Contents

Company organization; overview of construction industry; motivation theories, and incentive schemes, bonus schemes and their calculations; setting of target rates; cost systems and control; allocation of cost; project cost accounting, preliminary and final estimates. Measurement of work quantities, systematic plant selection, setting of hire rates of plant. Time value of money, cost of money and interest rates of the plant. Time value of money, cost of money and interest rates, return on investments.

4(ii) Course Learning Outcomes

At the end of the course, the students should be able to state/know:

1. Company organization;
2. overview of construction industry;
3. motivation theories, and incentive schemes, bonus schemes and their calculations;
4. setting of target rates;
5. cost systems and control;
6. allocation of cost;
7. project cost accounting,
8. preliminary and final estimates.
9. Measurement of work quantities,
10. systematic plant selection, setting of hire rates of plant.
11. Time value of money, cost of money and interest rates of the plant.
12. Return on investments.

5. Week and Days of Lectures

Week	**Days**	**Period**	**Lecture Topics**
1.	Wednesday	9am-11am	Company organization
2.	Wednesday	9am-11am	overview of construction industry.
3.	Wednesday	9am-11am	motivation theories, and incentive schemes, bonus schemes and their calculations
4.	Wednesday	9am-11am	setting of target rates

5.	Wednesday	9am-11am	cost systems and control
6.	Wednesday	9am-11am	allocation of cost
7.	Wednesday	9am-11am	project cost accounting
8.	Wednesday	9am-11am	preliminary and final estimates
9.	Wednesday	9am-11am	Measurement of work quantities
10.	Wednesday	9am-11am	systematic plant selection, setting of hire rates of plant
11.	Wednesday	9am-11	Time value of money,

		am	cost of money and interest rates of the plant
1 2.	Wednesday	9am-11am	Return on investments

6. Office hours for students

Tuesdays: 11am – 1:00pm, Thursdays: 10am – 1:00pm

7. Schedule for Quiz and Exams with Samples of Past Quiz and Examination Question Papers

Inception **Assignment/Quiz**	**Mid Semester Quiz**	**Revision**
Week 1	Week 8	Week 16

Please find attached documents

8. Model Answer/Marking Schemes of Examinations

Please find attached documents

9. Samples of Examination Booklets/Scripts

Please find attached documents

10. A brief writes up on how the course learning could be improved

Course learning could be improved by using teaching aids like field practice.

Course Code: CVE 561

Course Title: Urban Transportation Problem

Engineering Surveying 1, Credit Unit: 2

Units, Core

Lecturer Hours: 3 Credit

9. Lecturers' Name: Engr. I. U. Nwafor and Engr. S. I. Ikwueze
10. Phone No: +2349033208312
11. Email: innocent.nwafor@esut.edu.ng
12. Office hours for student: Tuesday and Friday

COURSE CONTENTS

i. Theories of Urban Development: Growth and character of towns, land use studies

- Transportation demand studies- data collections storage retrieval process, Trop generation Trip distribution, Origin and destination studies, Traffic management (Urban and Local areas; Designing of Traffic signals accident studies.)

ii. **SCHEDULE FOR QUIZ/ASSIGNMENT AND EXAMINATION**

Assignment/quiz	Quiz	Examination
Week 2 Week 4 Week 6	WEEK 8	Week 15

iii. **Course learning out come**

At the end of this course the students will gain the following experience.

i. Have the knowledge of major courses of Traffic problem in major cities and proffer solution on how to tackle each.
ii. The students will have knowledge of the land use act (Methods of acquisition by government and issues of right of way.)
iii. Effective way of studying and understand dry trip generation; vehicular movement from one point to the other.
iv. How to design pre-timed signal lights and automated signal at various locations.
v. The students will have knowledge of the various traffic signs on the roads.
vi. Traffic Islands and channelization is also part of this course benefit.

Conclusions:

The major object of this course is to present the best systematic and simple approach to solving major transportation problem both in the cities and local areas problem of a traffic jam, accidents, pollutions discomforts etc.

The need for funding of road maintenance and availability of government owned transport company is recommended where an improved traffic system is in place.

6.0 THE CURRICULUM

6.1 Curriculum and Learning Process:

The curriculum and learning process for Civil Engineering at Enugu State University of Science and Technology (ESUT) should be designed to align with the university's vision and mission, as well as the specific goals and objectives of the program. By incorporating these elements into the curriculum and learning process, ESUT can ensure that civil engineering students receive a comprehensive and well-rounded education that prepares them to be competent, ethical, and innovative professionals in the field of civil engineering.

Foundation Courses: The curriculum should include foundational courses in mathematics, physics, chemistry, and basic engineering sciences to provide students with a solid knowledge base.

Core Engineering Courses: The core courses should cover essential civil engineering disciplines, including structural engineering, geotechnical engineering, transportation engineering, water resources engineering, and environmental engineering. These courses should emphasize the principles, theories, and analytical techniques used in civil engineering practice.

Laboratory Work: Practical laboratory work should be integrated into the curriculum to provide hands-on experience with testing materials, analyzing data, and conducting experiments related to civil engineering. This will help students develop practical skills and reinforce theoretical concepts.

Design Projects: Design projects should be incorporated throughout the curriculum, allowing students to apply their knowledge and skills to real-world civil engineering problems. These projects can involve designing structures, analyzing infrastructure systems, or developing sustainable solutions, fostering creativity and critical thinking.

Field Visits and Industrial Training: To provide practical exposure, the curriculum should include field visits to construction sites, infrastructure projects, and relevant industries. Students can also undergo industrial training or internships, gaining firsthand experience in civil engineering practice and understanding the challenges faced in the industry.

Professional Development: The curriculum should include courses or modules that focus on professional development, such as engineering ethics, project management, communication skills, and teamwork. These courses will help students develop the necessary skills to excel in their professional careers.

Elective Courses: The curriculum should offer a range of elective courses that allow students to specialize in specific areas of civil engineering based on their interests and career goals. This can include courses in structural analysis and design, transportation planning, geotechnical engineering, environmental engineering, or construction management.

Research and Innovation: Encourage students to participate in research activities and promote innovation within the civil engineering field. This can involve faculty-led research projects, undergraduate research opportunities, or collaborations with industry partners to address real-world challenges.

Continuous Assessment and Feedback: Implement a continuous assessment system that includes assignments, quizzes, laboratory reports, and exams to evaluate students' progress. Provide regular feedback to help students identify areas for improvement and track their learning outcomes.

Engage Industry Experts: Invite industry experts and practitioners as guest lecturers or adjunct faculty members to share their experiences, industry insights, and emerging trends in civil engineering practice. This will expose students to real-world scenarios and enhance their understanding of industry expectations.

Active Learning Approaches: Utilize active learning approaches, such as group discussions, case studies, problem-solving exercises, and project-based learning, to promote student engagement and critical thinking. Encourage students to take ownership of their learning process and foster a collaborative learning environment.

Continuous Curriculum Review: Regularly review and update the curriculum to align with emerging trends, technological advancements, and changes in the civil engineering profession. Seek input from industry professionals, alumni, and other stakeholders to ensure the curriculum remains relevant and meets the evolving needs of the field.

Programme structure and course content and how they are appropriate to, consistent with and support range of intellectual practical skills and attainment of programme PLOs:

Programme structure and course content were carefully designed to provide a balanced combination of intellectual and practical skills. By aligning with PLOs, these programs equip students with the necessary knowledge, abilities, and attitudes to succeed in the field of civil engineering. Some of the elements are as follows;

Program Structure: The program structure typically follows a sequential progression, starting with foundational courses and gradually advancing to more specialized and advanced topics. This allows students to develop a strong foundation of knowledge and skills before delving into more specialized areas of civil engineering.

Foundational Courses: Foundational courses cover fundamental concepts in mathematics, physics, chemistry, and mechanics. These courses provide students with the necessary intellectual skills and knowledge to understand the principles underlying civil engineering.
Core Engineering Courses: Core engineering courses in civil engineering cover a broad range of topics, including structural analysis and design, geotechnical engineering, transportation engineering, environmental engineering, and water resources engineering. These courses are designed to develop both intellectual and practical skills, such as problem-solving, critical thinking, analysis, and design.
Laboratory and Design Courses: Laboratory courses provide hands-on experience in conducting experiments, data analysis, and instrumentation techniques. Design courses focus on applying engineering principles to real-world problems, where students work in teams to develop solutions. These courses enhance practical skills, such as experimentation, data collection, teamwork, and communication.
Technical Electives: Technical elective courses allow students to specialize in specific areas of interest within civil engineering, such as structural engineering, transportation planning, or environmental management. These courses provide opportunities for students to further develop their intellectual skills and deepen their knowledge in their chosen field.
Professional Practice: Civil engineering programs often include courses or modules that focus on professional practice, ethics, and project management. These courses develop practical skills in communication, leadership, teamwork, and project planning, which are essential for a successful engineering career.
PLOs Alignment: Program Learning Outcomes (PLOs) are specific learning outcomes that students are expected to achieve by the end of the program. The course content and structure are designed to align with these PLOs. For example, PLOs may include abilities such as problem-solving, technical competence, effective communication, and an understanding of ethical and environmental issues. The courses within the program are designed to develop and assess these skills and knowledge areas, ensuring students meet the desired PLOs.

Programme delivery and assessment methods and how they are appropriate to, consistent with and support range of intellectual practical skills and attainment of programme PLOs:

The delivery and assessment methods in a civil engineering program are crucial for fostering a range of intellectual and practical skills and supporting the attainment of program learning

outcomes (PLOs). Here is an overview of how these methods align with and support the desired outcomes:

Lecture-based Delivery: Lectures are a common method of delivering theoretical knowledge in civil engineering programs. They provide a platform for imparting intellectual skills such as conceptual understanding, critical analysis, and synthesis of information. Lectures can cover foundational concepts, theories, and principles necessary for engineering practice.

Laboratory and Practical Sessions: Laboratory and practical sessions provide hands-on experience and reinforce practical skills in civil engineering. These sessions involve conducting experiments, data collection, analysis, and instrumentation techniques. They support the development of practical skills, including experimentation, data interpretation, problem-solving, and technical competence.

Design Projects and Assignments: Design projects and assignments allow students to apply their theoretical knowledge to real-world engineering problems. These projects enhance both intellectual and practical skills by requiring critical thinking, problem-solving, creativity, and decision-making. They also promote teamwork, communication, and time management skills, which are crucial for engineering practice.

Field Visits and Site Work: Field visits and site work expose students to real engineering projects and construction sites. These experiences provide practical insights into the challenges and complexities of civil engineering practice. Students develop skills in site assessment, data collection, and observation, which are essential for understanding real-world applications of engineering principles.

Case Studies and Simulations: Case studies and simulations simulate real-world scenarios and challenges, allowing students to analyze and solve complex problems. These methods foster critical thinking, decision-making, and problem-solving skills, while also promoting an understanding of practical constraints and considerations in civil engineering.

Group Projects and Presentations: Group projects and presentations encourage collaboration, teamwork, and effective communication skills. Students work together to tackle engineering problems, share responsibilities, and present their findings and solutions. These activities enhance practical skills such as communication, leadership, and project management, which are crucial for professional engineering practice.

Assessments and Examinations: Assessments and examinations evaluate students' intellectual understanding, knowledge, and application of engineering concepts. They typically include a mix of written exams, problem-solving exercises, practical assessments, and project evaluations.

These assessment methods ensure that students meet the program's intellectual and practical skill requirements and demonstrate proficiency in the PLOs.

Professional Development Activities: Civil engineering programs often incorporate professional development activities, such as workshops, seminars, and guest lectures, to expose students to industry practices and trends. These activities help students develop a broader understanding of the profession and develop skills in networking, lifelong learning, and professional ethics.

Use of tutorials and non-conventional delivery methods such as Problem Based Learning (PBL) techniques alongside traditional lectures:

By incorporating tutorials, problem-based learning techniques, and non-conventional delivery methods into civil engineering programs, students gain a more holistic and practical understanding of the subject matter. These methods enhance critical thinking, problem-solving, teamwork, communication, and other intellectual and practical skills vital for successful civil engineering practice. Moreover, they help students develop a deeper appreciation for the complexities and real-world applications of the discipline. The process of application of these methods are as follows;

Tutorials: Tutorials provide an interactive learning environment where students can engage in discussions, ask questions, and receive individual or small group guidance from instructors. In civil engineering, tutorials can be used to deepen understanding of complex concepts, reinforce theoretical knowledge, and practice problem-solving skills. Tutorials allow students to actively engage with the material, ask clarifying questions, and seek further explanation, leading to better comprehension and retention of the subject matter.

Problem-Based Learning (PBL): PBL is an active learning approach that focuses on solving real-world problems within a collaborative and inquiry-based setting. In civil engineering, PBL can be employed by presenting students with authentic engineering challenges or case studies. Students work in groups to analyze the problem, conduct research, gather relevant data, and propose solutions. PBL fosters critical thinking, problem-solving, teamwork, and communication skills, all of which are crucial for civil engineering practice. It also allows students to develop a deeper understanding of how theoretical concepts apply to real-life situations.

Case Studies and Project-Based Learning: Integrating case studies and project-based learning into civil engineering programs allows students to apply their theoretical knowledge to practical scenarios. Case studies provide real-world examples of engineering problems and challenges, enabling students to analyze and propose solutions based on the concepts learned. Project-based learning involves working on comprehensive engineering projects that simulate real-world conditions. These methods encourage students to think holistically, consider interdisciplinary factors, develop practical skills, and foster creativity.

Guest Speakers and Industry Involvement: Bringing in guest speakers from industry or involving industry professionals in the learning process provides students with valuable insights into real-world engineering practices, challenges, and innovations. Guest speakers can deliver talks, share their experiences, and engage in discussions with students. This exposure helps bridge the gap between academia and industry, enhances students' understanding of the profession, and promotes the development of industry-relevant skills.

Field Trips and Site Visits: Field trips and site visits offer practical exposure to civil engineering projects and construction sites. Students can observe and analyze real-world applications of engineering principles, construction techniques, and project management. These experiences provide context, foster a deeper understanding of the challenges faced in the field, and promote the integration of theoretical knowledge with practical applications.

How the requirements of Complex Problem Solving (CPS) and Complex Engineering Activities (CEA) have been addressed:

By incorporating these elements into the civil engineering curriculum, programs effectively address the requirements of Complex Problem Solving (CPS) and Complex Engineering Activities (CEA). Students acquire the necessary knowledge, skills, and experiences to tackle intricate engineering problems, make informed decisions, and contribute to innovative solutions. These requirements are addressed as follows;

Curriculum Design: Civil engineering programs are designed to provide students with a solid foundation in engineering principles, analytical thinking, and problem-solving techniques. The curriculum includes courses that cover a wide range of technical subjects, including structural analysis, geotechnical engineering, transportation planning, environmental management, and construction project management. These courses equip students with the necessary knowledge and skills to address complex engineering problems.

Design Projects and Assignments: Design projects and assignments are an integral part of civil engineering programs. Students are tasked with solving real-world engineering problems, such as designing a structure, developing a transportation network, or addressing environmental challenges. These projects require students to analyze complex systems, consider multiple factors and constraints, and propose appropriate engineering solutions. By engaging in these activities, students develop their CPS and CEA skills, including critical thinking, decision-making, and creative problem-solving.

Collaborative Learning and Team Projects: Civil engineering programs often emphasize collaborative learning and teamwork. Students work in groups to tackle engineering challenges, share responsibilities, and develop solutions. Collaborative learning promotes the exchange of ideas, diverse perspectives, and the ability to work effectively in interdisciplinary teams. It allows students to navigate complex engineering activities, manage project constraints, and leverage the strengths of team members to achieve successful outcomes.

Advanced Technical Electives: Civil engineering programs often provide students with the opportunity to choose advanced technical electives in specialized areas of interest. These courses delve deeper into complex engineering topics and allow students to explore specific domains, such as structural dynamics, transportation system optimization, or sustainable construction practices. By studying these advanced topics, students further enhance their CPS and CEA skills, becoming adept at handling complex challenges in their chosen field.

Research and Innovation: Civil engineering programs may incorporate research components or opportunities for students to engage in independent research projects. Research activities encourage students to investigate and solve complex engineering problems, applying scientific methodologies and analytical techniques. Through research, students develop critical thinking, problem-solving, and data analysis skills while contributing to the advancement of knowledge in the field.

Industry Partnerships and Internships: Collaborations with industry partners and internships provide students with exposure to real-world engineering projects and environments. Industry partnerships can involve joint research projects, guest lectures, or mentorship programs. Internships, on the other hand, allow students to work in professional engineering settings, gaining practical experience and exposure to complex engineering activities. These experiences enhance students' ability to navigate and solve complex engineering challenges in real-world contexts.

6.2 OUTLINE OF COURSE (CIVIL ENGINEERING)

100 LEVEL

FIRST SEMESTER

COURSE CODE	COURSE TITLE	CREDIT
GST 111	Communication in English I	2
GST 113	Nigerian Peoples and Culture	2
GST 121	Use of library study skills & ICT	2
ICH 111	General Chemistry I	3
ICH 197	General Practical Chemistry I	1
MAT 111	Elementary Mathematics I	3
PHY 111	General Physics I	3
PHY 197	General Practical Physics I	1
CEE 121	Computer Programming	3
	Total	20

SECOND SEMESTER

COURSE CODE	COURSE TITLE	CREDIT
GST 112	Communication in English II	2
MEC 122	Basic Engineering Drawing	2
ICH 112	General Chemistry II	3
ICH 198	General Practical Chemistry II	1
MAT 112	Elementary Mathematics II	3
PHY 112	General Physics II	3
PHY 198	General Practical Physics II	1
MME 122	Engineering Materials	3
GST 118	Peace Studies & Conflict Resolution	2
GST 114	Social Sciences	2
	Total	22

200 LEVEL

FIRST SEMESTER

COURSE CODE	COURSE TITLE	CREDIT
EEE 221	Applied Electricity I	3
FEG 221	Engineer in Society	2
MEC 223	Engineering Drawing I	2
CHE 225	Fundamentals of fluid mechanics	3

CVE 227	Applied Mechanics (Dynamics)	3
FEG 227	Engineering Mathematics I	3
FEG 293	General Engineering Laboratory course	1
CEE 221	Introduction to Modelling & Simulation	2
	Total	19

SECOND SEMESTER

COURSE CODE	**COURSE TITLE**	**CREDIT**
ENS 222	Introduction to Entrepreneurship	2
EEE 222	Applied Electricity II	3
MEC 224	Engineering Drawing II	2
FEG 294	Student Workshop Experience	1
CHE 226	Fundamentals of Thermodynamics	3
CVE 228	Strength of Materials I	3
FEG 228	Engineering Mathematics II	3
FEG 290	Student Work Experience Programme (SIWES I)	2
	Total	19

300 LEVEL

FIRST SEMESTER

COURSE CODE	COURSE TITLE	CREDIT
ENS 311	Entrepreneurship Practicum	2
FEG 321	Engineering Mathematics III	3
CVE 301	Computer Applications in Civil Engineering	2
CVE 331	Strength of Materials II	2
CVE 337	Civil Engineering Materials	2
CVE 335	Engineering Drawing and Detailing	2
CVE 341	Engineering Geology I	2
CVE 351	Fluid Mechanics	2
CVE 371	Engineering Surveying I	
	Total	19

SECOND SEMESTER

COURSE CODE	COURSE TITLE	CREDIT
FEG 322	Engineering Mathematics IV	3
FEG 390	SIWES II	3
CVE 334	Construction Planning	2
CVE 338	Concrete Technology	2
CVE 342	Engineering Geology II	2
CVE 344	Soil Mechanics	2

CVE 354	Structural Mechanics I	2
CVE 352	Design of Reinforced Concrete Structures	2
CVE 372	Engineering Surveying II	2
	Total	20

400 LEVEL

FIRST SEMESTER

COURSE CODE	**COURSE TITLE**	**CREDIT**
CVE 431	Engineering Project Management	2
CVE 401	Statistical Methods in Civil Engineering	2
CVE 433	Structural Mechanics II	3
CVE 435	Analysis and Computation	3
CVE 443	Soil Engineering	3
CVE 451	Engineering Hydrology	3
CVE 453	Sanitary Engineering	3
CVE 461	Highway and Transportation I	2
	Total	21

SECOND SEMESTER

INDUSTRIAL ATTACHMENT - 6 CREDIT

Programme for Industrial Training

1. **Drawing Office Practice:** Reduction of surveying and geo-technical data and presentation of design, working drawings and bar bending schedules.
2. **Design Office Practice:** Design of Highways, Building Structures, Retaining structures, Drainages and Foundations and Earth Structures.
3. **Civil Engineering Materials Laboratory Work:** Testing and reporting on various Materials for Construction including soils, cement, concrete, asphaltic concrete, water and steel products.
4. **Civil Engineering Field Practice:** Surveying, construction Operation, Site Exploration and Evaluations, Construction Supervision, Construction Progress Measurements and Contract Payment.
5. Industrial Training (IT) Report.

500 LEVEL

FIRST SEMESTER

C0URSE CODE	**COURSE TITLE**	**CREDIT**
CVE 535	Construction Management I	2
CVE 501	Civil Engineering Research Methods	2
CVE 541	Dynamics & Stability of Structures	2
CVE 545	Design of Steel Structures	2
CVE 543	Geotechnical Engineering	2
CVE 551	Hydraulics	2

CVE 561	Urban Transportation Problems	2
CVE 5XX	Civil Engineering Electives (See below)	2
CVE 598	Civil Engineering Design Project	4
	Total	20

SECOND SEMESTER

C0URSE CODE	**COURSE TITLE**	**CREDIT**
CVE 536	Construction Management II	2
CVE 546	Design of Timber Structures	2
CVE 544	Geotechnical Engineering II	2
CVE 552	Water Resources Engineering	2
CVE 562	Highway and Transportation II	2
CVE 564	Advanced Highway Engineering	2
CVE 599	Project	6
	Total	18

Elective: First Semester

CVE 537: Advanced Structural Analysis

CVE 539: Bridge Design

Elective: Second Semester

CVE 564: Advanced Highway Engineering

CVE 556: Applied Hydraulics

CVE 576: Topics in Foundations

6.3 COURSE CONTENT DESCRIPTION

100 LEVEL (First & Second Semester)

GST 111: Communication in English I – 2Units

Effective communication and writing in English, Language skills, Writing of essay answers, Comprehension, Sentence construction, Outlines and paragraphs, Collection and organization of materials and logical presentation, Punctuation, Word and word usage, rules of concord, Idioms and figurative expressions. Introduction to Literature I.

GST 113: Nigeria Peoples and Culture – 2Units.

Study of Nigerian history , culture arts in pre-colonial times, Nigerian's perception of his world, Culture areas of Nigerian and their characteristics, Evolution of Nigerian as a political unit, Indigene/settler development, Norms and values, Negative attitudes and conducts (cultism and related vices), Re-orientation of moral and national values, Moral obligations of citizens , environmental problems. The spirit of nationalism, patriotism, personal and group discipline; self-reliance, endurance, maintenance cultures; to restore and encourage research for indigenous traditional and Nigerian cultural heritage.

GST 121: Use of Library Study Skills & ICT – 2Units

A brief survey of the main branches of Philosophy Symbolic Logic Special symbols in symbolic Logic-conjunction, negation, affirmation, disjunction, equivalent and conditional statements law of tort. The method of deduction using rules of inference and bi-conditionals qualification theory. Types of discourse, Nature of arguments, Validity and soundness; Techniques for evaluating arguments, Distinction between inductive and deductive inferences, e.t.c.

(Illustrations will be taken from familiar texts, including literature materials, Novels, Law reports and newspaper publications).

ICH 111: General Chemistry I – 3Units

Atoms, Dalton's atomic theory and atomic masses. Fundamental particles of the atom and atomic structure. Modern electronic theory of atoms. Periodicity of the elements, Mole concept, chemical formulae equations. States of mater; gas, liquid and solid. Energetic and thermo chemistry, Chemical kinetics; equilibria and electrochemistry.

ICH 197: General Practical Chemistry I – 1Unit

Theory and practice of qualitative chemical analysis, calculations, data analysis and presentation, Acid-base, oxidation-reduction reactions, precipitation and complexometric titrations. Gravimetric analysis.

MAT 111: General Mathematics l – 3Units

Elementary set theory, subsets, union, intersection, complements and Venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, Real sequences and series and arithmetic and geometric progressions. Theory of quadratic equations. Binomial theory, complex numbers, algebra of complex numbers, the Argond diagram, De Moivre's theorems and the nth roots of unity. Circular measure; trigonometric function of angles of any magnitude, addition and factor formulae.

PHY 111: General Physics I – 3Units

Units and dimensions: Scalar and vectors. Particle kinematics. Newton's laws. Friction, work and energy, Centre of mass. Simple harmonic motion and rigid body dynamics. Kepler's law. Pressure in fluids, intermolecular forces, Hooke's law and Young's modulus, Fluid flow streamline turbulence, Stoke's law and surface tension.

PHY 197: General Practical Physics 1 - 1Unit

At least six experiments from the following use of measuring instruments, viscosity, surface tension, oscillation about an equilibrium position, Hook's law, moment of inertia, focal length of lenses, refractive index, optical instruments, the sonometer, heat capacity, volume expansion and latent heat.

CEE 121: Computer Programming - 3Units

Program design using pseudo-code/flow chart. Extensive examples and exercises in solving engineering problems using pseudo-code chart. Computer programming using structured BASIC such as QBASIC; symbol, keywords, identifier, data types, operators, statements, flow of control, arrays and functions. Extensive examples and exercises in solving engineering problems using QBQSIC. Use of visual programming such as visual BASIC in solving engineering problems.

GST 112: Communication in English II – 2Units

Language registers; Phonetics, Comprehension, continuous writing, outlines, paragraphs and essays. Technical writing, Collection and organization of materials and presentation of papers. Memoranda on various topics, official correspondence. Art of public speaking; Introduction to Literature II.

GST 114: Social Sciences - 2Units

Man-his origin and nature , Man and his cosmic environment, Scientific methodology, Science and technology in the society service of man, Renewable and non-renewable resources –man and his energy resources, Environmental effects of chemical plastics, Textiles, Wastes and other material , Chemical and radiochemical hazards, introduction to the various areas of science and technology. Element of environmental studies.

GST 118: Peace & Conflict Resolution - 2Units

Peace studies and conflict resolution is specifically designed to develop the intellectual capacities of individuals to understand, appreciate and promote peaceful coexistence. The contents of part I include: Theories and basic concepts, Peace and conflict management styles and the role of the state and civil society in issues of peace and conflict. The contents of part II

include: Basic issues in peace studies and conflict management, Gender, human right and environmental issues in peace and conflict studies and case studies in peace and conflict resolution in Nigeria.

MEC 122: Basic Engineering Drawing - 2Units

Transfer of lettering, dimensioning, orthographic projection, auxiliary and mechanical sectional view, true length, graphical calculus and architectural drawings.

ICH 112: General Chemistry II – 3Units

Historic survey of the development and importance of organic chemistry, Fundamental groups, nomenclature and classes of organic compounds. Basic organic chemistry reactions of saturated and unsaturated hydrocarbons. Stereochemistry of hydrocarbon compounds. Isolation and purification of organic compounds.

ICH 198: General Practical Chemistry II – 1Unit

Qualitative inorganic and organic analysis for element in Group IA, IIA, IIIA, IVA, IB, IIB, IIIB. Chemical analysis for functional groups: acidic ketonic, carboxylic, etc.

MAT112: Elementary Mathematics II – 3Units

Mapping bisection, composition, inverse mapping, binary operations, associativity, identity elements and inverse element and distributivity; Relations; fundamental theorem of equivalent relations. Trigonometric ratios, sums and products formulae, multiple and sub multiple angles, graph of trigonometric functions and inverse circular functions. Solutions of triangles and trigonometric equations. Heights and distance in 2 and 3 dimensions geometry. Equations of line and planes, and other applications. Angle between two lines. Method of integration, Double integrals, differential equations, Taylor's and Maclaurin's theorems

PHY 112: General Physics II – 3Units

Reflection and refraction; Transmission and absorption of light. Optical instruments, Quantum nature of light. Coulombs' law, Gauss's theorem. Capacitors. Magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometer. Multimeter, D.C and A.C

meters and generators. Hysteresis, power in A.C. circuit, semiconductors, conductivity and mobility, Rectification.

PHY 198: General Practical Physics II – 1Unit

At least six experiments from the following potential differences and internal resistance of cells use potentiometer circuit, the metre bridge, simple current measuring instruments. Planck's constants and radioactivity.

MME 122: Engineering Materials – 3Units

Introduction to electronics configuration, atomic structures, interatomic bonding mechanisms, crystal and microstructure, Relationship between structure and properties of metals, alloys, ceramics and plastics. Principles of behavior of materials in common environments. Fabrication processes and applications.

200 LEVEL (First Semester)

CVE 227: Applied Mechanics- Dynamics- 3 credits

Co-ordinate systems and position vectors; Kinematics of a particle in plane motion in different co-ordinates; Displacement, Velocity and Acceleration of a particle: Kinetics of particle in plane motion. Newton's laws: Types of forces; Systems of particles. Centre of mass; Simple harmonic motion; Impulse and Momentum; Kinematics of a rigid body in plane motion: Types of motions, Relative motion between two points on a rigid body; velocity diagrams; instantaneous centre of rotation; Kinetics of rigid body in plane motion; work and energy for a system of particles; Kinetics of rigid body; potential energy; General energy principles; virtual work; D'Alembert's Principles.

Second semester

CVE 228: Strength of Material I- 3 credits,

Fundamental hypothesis in strength of material, problems and methods in strength of materials, external and internal forces, stresses, displacement and deformations. Hooke's law

and principles of superposition; general principles of structural analysis, tension and compression, internal forces and stress on cross-section of a rod in tension and compression, elongation of a bar and Hooke's law. Potential energy of strain, pure shear and its characteristics; torsion of a rod of circular and noncircular cross section; geometrical characteristics of a section; moments and principal moment of inertia of a section; stresses on transverse and oblique bending.

300 LEVEL (First & Second Semester)

CVE 301: Computer Applications in Civil Engineering - 2 credits
Students should develop solutions to variety of civil engineering problems using application programs such as AutoCad, civilsoft, orion, waterCad and Excel. Problem solving and structured programming with software tools useful to civil engineering computation and design should be emphasized.

CVE 331: Strength of Material II-2 credits (Practical)
The differential equation of the elastic curve; the differential equation of the elastic curve of a beam, displacements in bending. General Equations of the Elastic curve of simple beams and cantilevers with arbitrary loadings; Method of superposition, slopes and deflection method and three moments method (Clapeyrons methods) in the analysis of continuous indeterminate beam. Displacements in a beam under arbitrary loading; potential energy of a beam in the general case of loading; Castigliano's theorem; Mohr's Integral, Verruschagin's Method and Betti's reciprocal theorem; introduction to theory of thin-walled structures with open profile; Vlasov's differential equations of equilibrium Boundary conditions and various methods of solution.

CVE 334: Construction Planning- 2 credits

Introduction to planning in everyday life, planning techniques. Job activities, types of activities, assessing the duration of activities. Bar charts and linked bar charts. Job logic and restraints, events, time analysis. Network diagram, isolation of critical path, float and associated problems. Construction materials and equipment, quantity valuation, swell and shrinkage factor problems. Equipment fundamentals, outputs and production, Compaction and equipment. Site layout and

organization; setting out of buildings; Types and methods of construction of principal elements; types and electricity and water supply-internal external finishes.

CVE 335: Civil Engineering Drawing and Detailing- 2 credits (Studio)

Review of basic geometric constructions: legends, symbols and notes. Drawing scales, notation (labelling and texts) and dimensions. Civil engineering working drawing: road alignments, profiles and sections. Detailing of drainage structures; culverts, resources, elevated water tanks and retaining walls. Plotting/printing of drawings. Design and modelling of buildings using ARCHICAD/REVIT, Civil Engineering Drafting and Detailing using AUTOCAD.

CVE 337: Civil Engineering Materials- 2 credits (Practical)

Properties of construction materials; physical; mechanical and chemical properties. Stones: classifications, quarrying, deterioration, dressing, preservation and testing of stones. Bricks, mineral binders Portland, cements; aggregates test; Timber classification and characteristics. Effects of seasoning and preservation of Timber. Metals:- pig-iron, cast iron, wrought iron, steel, ,manufacture and metallurgy of iron and steel, composition and grades of steel; welding of metal; nonferrous metals and Alloys. Corrosion and protection of metals. Plastic, Glass, Bitumen and tar based materials.

CVE 338: Concrete Technology- 2 credits (Practical)

Rheology of fresh concrete, mechanical properties of hardened concrete, non-destructive testing methods and relationship between static and dynamic moduli. Elasticity shrinkage and creep of concrete; durability of concrete, light weight and high density concrete. Pressure against formwork, maturity of concrete. Mix design production and quality control, transportation and placing of concrete, concreting equipment.

CVE 341: Engineering Geology I-2 credits (Practical)

Geology and its relation to civil engineering: The internal structure of the Earth: Methods of geologic explorations; Energy fundamental concept and its relationship to geologic processes of relevance to civil engineering. Discontinuities and deformation of the earth's significance in civil engineering; classification of rocks, their engineering characteristics; weathering, erosion and

mass wasting their significance in engineering works and environmental degradation; Geology of dam reservoir sites.

CVE 342: Engineering Geology II-2 credits

Rock-soil cycle; chemical composition of soil/clay. Mineralogy phase relationship: Specific gravity of the soil, grain size distribution; plasticity, soil structure and theory of compaction, shear resistance of soil, strength conditions; soil testing; stability of slopes, landslides; Retaining walls, creep and settlement of foundation; site exploration for buildings, highways. Airport, bridges, dam sites; compressibility and shear strength.

CVE 344: Soil Mechanics- 2 credits (Practical)

Stresses in soil, Geostatic stresses, Boussinesq's stress distribution theory; Westergaard's theory, Stresses in soil due to loads on circular foundation areas. Stresses due to loads on rectangular foundation areas. Elastic deformation analysis, Steinbrenner's solution, Seepage, Darcy's law, Continuity equation, Equation of seepage, Laboratory tests to determine the coefficient of permeability, Falling head permeability test, Constant head permeability test. Field methods, Solutions to seepage problems, Seepage in earth Dams, Consolidation, Terzaghi's theory of consolidation, Solution to Terzaghi's one dimensional consolidation equation, Laboratory consolidation test, Consolidation settlements. Stability of slopes, Method of slices, Bishop's method, Fellenius method, Janbu's method.

CVE 351: Fluid Mechanics- 2 credits (Practical)

Fluid fundamentals: definitions, units, dimensions. Fluid statics, fluid pressure Manometer, fluid thrust on immersed plane surfaces and on immersed curved surfaces; stability of floating and submerged bodies-density, vapour, pressure, viscosity, and surface tension of fluids.
Fluid measurement: pitot and pitot-static tubes, orifices, nozzles, venturimeters, weirs and notches. Real fluid flow, Reynolds's experiment, laminar and turbulent, velocity distribution. Laminar flow between parallel plates, through circular tubes, boundary layers and separation.

CVE 352: Design of RC Structures - 2 credits

Reinforced concrete as a structural material, specification, concrete strength classes. Various kinds of reinforcing bars, Characteristics. Application of RC in building, tanks and other structures, construction member – particularities of design. Industrial buildings. Most frequently used schemes crane girders etc.

CVE 354: Structural Mechanics I- 2 credits

Kinematics analysis of structures, various methods of verifying geometrical instability of structures. Analysis of statically indeterminate structures including beams, frames, arches, trusses, three dimensional structures. Influence lines and various methods of their determination. Application of influence lines in analysis of determinate structures under the action of moving load; slopes and deflections.

CVE 371: Engineering Survey I-2 credits (Practical)

Theory: Introduction to Geodesy: definitions, basic principles, types of surveys; theory of measurements and errors; surveying instruments and their adjustments. Chain surveying; traversing; compass and theodolites traversing; levelling; geometry and hydrographic surveys.
Practicals: Adjustment and use of surveying equipment; Traversing levelling for contour maps, profiles.

CVE 372: Engineering Survey II-2 credits (Practical)

Theory: Longitudinal and cross sections, properties and definition of contours; areas and volumes; various methods of measuring areas and volumes, constructional surveys: Setting out of building, road alignment, drains, railways etc.; Horizontal and vertical curves photo grammetry.

CVE 390: SIWES II-3 credits

Third year students vacation programme.

400 LEVEL (First Semester)

CVE 401: Statistical Methods in Civil Engineering - 2 credits

Introduction to fundamentals of probability for civil engineering, statistical methods and data analysis in civil engineering. Descriptive statistics in civil engineering, elementary probability in civil engineering, sampling distributions in civil engineering, inference, testing hypothesis and estimation in civil engineering. Normal, binomial and Poisson's distributions applied to civil engineering, one-way analysis of variance, regression analysis in civil engineering.

CVE 431: Engineering Projects Management- 2 credits

Business and professional relation in engineering; elements of business law; the law of contracts; labour laws; workmen compensation acts; minimum wage law; contract documents; specifications; the conflict between drawings and specifications. Addendum to specifications. Standard and master specifications; specification writing; task allocation and liability sharing, claims, disputes and arbitration, presentation of engineering evidence.

CVE 433: Structural Mechanics II - 3 credits

Analysis of statically indeterminate structures including continuous beams, rigid frames, arches, and trusses. Force and deformation methods, elastic curve, use of symmetry, effects of temperature changes and movement of supports; moment distribution; influence lines.

CVE 435: Analysis and Computation - 3 credits

Matrix methods of structural analysis; engineering analysis and computation with MS Excel, Matlab techniques to linear and non-linear equation. Computer-aided design and drafting using: AutoCAD, Civil-Soft and Quick-struct packages in structural computations.

CVE 443: Soil Engineering - 3 credits

Introduction to foundations/footings (column) pad foundations combined footings, Raft foundations, Considerations in footing design – Settlement – bearing capacity, Bearing capacity analysis, Terzaghi's bearing capacity theory, Meyerhoff's bearing capacity theory, Brinch Hansen's bearing capacity theory, Design of footings, Design of column footings, Design of

combined footings, Design of Raft footings, Geotechnical investigation of soils for engineering projects.

CVE 451: Engineering Hydrology - 3 credits

Analysis of daily rainfall data; probability and stochastic analysis, point and area statistics, intensity / frequency / duration and depth / frequency analysis; analysis of storm profiles, infiltration theory, measurement and interpretation, evapotranspiration; hydrograph and unit hydrograph theory; flood routing.

CVE 453: Sanitary Engineering - 3 credits

Theory and laboratory work for the design of physical, chemical and biological processes for the water and wastewater treatment; design of storm water and sewage collection systems. Importance of small water-works; economical and safe water supply and treatment methods; waste disposal including aqua privies and pit latrines.

CVE 461: Highway and Transportation I - 2 credits

Transportation engineering in a developing nation; elementary traffic management; highway location and design; traffic surveys; highways economics and administration; highway material, soils, asphalt, soil-cement, aggregates etc.; highway pavement design both flexible and rigid; failure studies and remedial measures.

500 LEVEL (First and Second Semester)

CVE 501: Civil Engineering Research Methods - 2 credits

Introduction to civil engineering research methods, literature search techniques and reference tools. Detailed explanation of technical writing skills and organization of research reports.

CVE 535: Construction Management I - 2 credits

Company organization; overview of construction industry; motivation theories, and incentive schemes, bonus schemes and their calculations; setting of target rates; cost systems and

control; allocation of cost; project cost accounting, preliminary and final estimates. Measurement of work quantities, systematic plant selection, and setting of hire rates of plant. Time value of money, cost of money and interest rates of the plant, return on investments.

CVE 536: Construction Management II - 2 credits

Preconstruction operation; issuance of bidding documents, opening, accepting and documentation of bids, instruction of bidders, irregularities in the preparation and submission of bids; analysis and comparison of bids; unbalanced bids; awarding of contracts. Suggestion for obtaining lowest bids. Value engineering; measurements and payments of contract stages; meeting and negotiation; construction safety; responsibilities and rights of the owner; responsibilities of the engineer; registration of professional engineers; litigation arising from supervision of construction projects.

CVE 537: Advanced Structural Analysis - 2 credits (elective)

Analysis of uniaxial and biaxial bending on short columns, transformation of eccentric columns loads into axial load and bending. Analysis of bucking and stability in beams, columns and struts. Euler critical load of slender columns and struts. Energy methods in structural analysis, strain energy and complementary energy determination in structural members under load. Principle of real work and virtual work. Castigliano's theorem. Application of energy methods in the determination of deformation (slopes, deflection, sidesways) in the determinate beams, frames, trusses. Application of energy methods in the analysis of indeterminate beams, frames and trusses.

CVE 539: Bridge Design - 2 credits (elective)

Various types of bridges in respect of material, purpose and systems; main elements of the bridge structure; load and design specifications including AASHO and HS loading in respect of highway beam bridges in R.C and in steel; cooper E30 and E60 loadings in respect to Railways Steel bridges.

CVE 541: Dynamics and Stability of Structures - 2credits

Definitions in the structural dynamics; single degree of freedom (SDOF) systems; Damped and un-damped systems; self-excitation and critical damping; free and forced vibrations of SDOF systems. Lumped parameter systems with application to civil engineering structures; Euler's differential equation and the theory of Elasticity with application to direct vibrational method, critical load evaluation; stability of frames, arches and rings.

CVE 543: Geotechnical Engineering I - 2 credits

Introduction to retaining walls, Lateral earth pressure theories, Rankine's earth pressure theory, Coulomb's earth pressure theory, Design of retaining walls, Cantilever, counterfort, Buttressed walls, Gravity and Semi-gravity walls, Sheet pile walls, Cantilever sheet pile walls, Anchored sheet pile walls, Free earth support method.

CVE 544: Geotechnical Engineering II - 2 credits

Pile foundations, Types of pile foundations, Pile load bearing capacity analysis, Negative skin friction, Pile groups, Pile Group load carrying capacity, Settlement analysis, Stress analysis due to piles, Machine foundations, Soil dynamics, Mass spring systems, Vibrating footing mass spring systems with damping, Forced vibrations, Natural frequency of foundation soil system, Barken's method, Pauw's method, Bulb of pressure concept, Dynamic analysis of block foundations, Introduction to soil structure interaction, Winkler's model, Euler Bernoulli beam on Winkler foundation.

CVE 545: Design of Steel Structures - 2 credits

Various kinds of steel, their properties and admissible stresses; steel structures applied to communication towers, tanks building main and secondary beams, column, design of members and connection; joint details; crane girders, bracing systems; plate girder, roof trusses, design specifications and their implementation.

CVE 546: Design of Timber Structures - 2 credits

Structural properties of natural wood; classification of structural timber; glued laminated timber and plywood; seasoning, preservation and fire-resistance; design of beams. Columns

and diaphragms, timber connectors; application in buildings, electric poles, bridges and form work for concrete.

CVE 551: Hydraulics - 2 credits

Fundamental principles of fluid mechanics; flow measurement devices and hydraulic structures, floats current meters, weirs flumes, culverts spillways, siphons, stilling basins. Dynamics of fluid flow; the continuity equation. Bernoulli and impulse momentum equations experiments, pipeline problems- single and multiple pipes, network analysis by Hardy Cross method, linear theory method. Uniform flow in open channels, fundamental relationship, Chezy equation. Hydraulic radius consideration best hydraulic section; non- uniform flow in channels.

CVE 552: Water Resources Engineering - 2 credits

Planning and management of water resource projects, river basins and watersheds; ground water resources; hydraulics of wells; surface water development; irrigation principles and practice. Turbomachines - pumps and turbines. Similarity rules, pump characteristics / performance curves; capitation. Design pumping mains and gravity mains; service reservoirs; specific water treatment processes; environmental impact analysis.

CVE 556: Applied Hydraulics - 2 credits (elective)

Non uniform flow; draw-down computations; back-water curves; Engineering concepts for design of water distribution networks; transportation and distribution of water; distribution reservoirs and service storage. Pump head efficiency. Water power engineering.

CVE 561: Urban Transportation Problems - 2 credits

Routes and manifestation of urban transportation planning and problems, theories of urban development; growth and character of towns; land use studies; transportation demand studies; data collection, storage retrieval and processing; trip generation and attraction. Trip distribution, goods movement, modal split and traffic route assignment. TSM Planning and Local area traffic management.

CVE 562: Highway and Transportation II - 2 credits

Introduction of design and maintenance of pavement; highway drainage structures; silting of side ditches; erosion of side slopes and prevention; practical projects.

CVE 564: Advanced Highway Engineering - 3 credits

Transportation problems in developing countries; characteristics of development; rural inter urban and urban transportation problems; planning, modelling, associated data requirements, issues of transportation policy, dependence; adaptation to local conditions; non-motorised transport; river development; coastal erosion control. Harbor-duck engineering, present performance rating of highway pavement. Railway engineering.

CVE 576: Topics in Foundations - 2 credits

Lumped parameter systems applied to the modelling of the infinite half space, lamb and the dynamic Boussinesq problem. SDOF systems; Bysmeranalog; waves in elastic media; Cagniard-de Hoop transformations; application to dynamic foundation problems.

CVE 598: Civil Engineering Design Project - 4 credits

Students pick up topics or projects in the area other than those of their thesis work. This helps to balance their exposure to the different areas of civil engineering. All deficiencies in the laboratory works or design, if any, are remedied during this phase of their study.

CVE 599: Project - 6 credits

Students are required to carry out a research / investigation type of project of relevance to civil engineering practice in Nigeria. The project is concluded in a formal thesis submitted and defended before an external examiner.

7.0 STAFFING

7.1 ACADEMIC STAFF DATA

S/N	Name	Academic Qualifications	Professional Qualifications	Rank
1	Celestine ODENIGBO	B.Eng. Hons (Chemical Engineering) M.Eng. (Water Resources and Environmental Engineering) Ph.D (Water Resources and Environmental Engineering)	MNSE 32437 COREN R.33676	Senior Lecturer
2	Charles Chinwuba IKE	B.Eng. Hons (Civil Engineering) M.Eng. (Soil Mechanics and Foundation Engineering) M.Eng. (Structures) Ph.D (Structures)	MNSE 8867 COREN R.7801	Professor
3	Patrick Nnaemezie ONUAMAH	B.Eng. Hons (Civil Engineering) M.Eng. (Structures) Ph.D (Structures)	MNSE 3542 COREN R.4328	Professor
4	Sandra Chinenyenwa ANIJIOFOR-IKE	B.Eng. Hons (Civil Engineering) M.Eng. (Water Resources and Environmental Engineering) Ph.D (Sanitary and Environmental Engineering)	MNSE 23817 COREN R. 22803	Senior Lecturer
5	Edwin Uchechukwu IKWUEZE	M.Sc. (Civil Engineering) Ph.D (ongoing)	MNSE 11356 COREN R.23599	Senior Lecturer
6	Juliet Nneka UGWU	B.Eng. Hons (Civil Engineering) M.Eng. (Structures) Ph.D (ongoing)	MNSE 26380 COREN R.24355	Lecturer I
7	Johnmartin Ikemefuna ENEM	B.Eng. Hons (Civil Engineering) M.Eng. (Structures) Ph.D (Stuctures)	MNSE 28417 COREN R.25244	Lecturer I

8	Donald Chidiebere UGWUANYI	B.Eng. Hons (Civil Engineering) M.Eng. (Construction Management) Ph.D (Construction Management, 2021)	MNSE 35748 COREN R.33146	Lecturer I
9	Innocent Uchenna NWAFOR	B.Eng. Hons (Civil Engineering) M.Eng. (Construction Management) Ph.D (ongoing)	MNSE 39467 COREN R.36219	Lecturer II
10	Stella Nneka IKWUEZE	B.Eng. Hons (Civil Engineering) M.Eng. (Construction Management) Ph.D (Construction Management)	MNSE 37446 COREN R. 33529	Lecturer II
11	John Precious NNAM	B.Eng. Hons (Civil Engineering) M.Eng. (Civil Engineering) Ph.D (ongoing)	MNSE COREN R.12636	Lecturer II
12	Paul Chijioke AMULU	B.Eng. Hons (Civil Engineering) M.Eng. (Structures)	MNSE 37411 COREN R. 36754	Lecturer II
13	Jonah Chukwuemeka AGUNWAMBA	B. Eng. Hons (Civil Engineering) M. Eng. (Water Resources and Environmental Engineering) Ph.D (Water Resources and Environmental Engineering)	MNSE COREN R.8629	Adjunct Professor
13	Charles Kanayochukwu AJAH	B. Eng. Hons (Civil Engineering) M. Eng. (Water Resources & Environmental Engineering) Ph.D (Water Resources & Environmental Engineering)	COREN R.22745	Adjunct Reader
14	Micah E. OBIEGBU	B.Sc (Building) Tuskegee University Alabama USA, 1979 MSc (Auburn University Auburn, USA, 1981)	CORBON MNIOB	Contract Senior Lecturer

		PhD (Nnamdi Azikiwe University Awka, 2016)		
15	Solomon Emeka ORJI	BSc (Building) MSc (Construction Management) PhD (Construction Project Management)	CORBON MNIOB, MPMI, QAA, IQAM, EQAM	Reader
16	Uchenna Charity EKEKEZIE	BSc (Building) MSc (Construction Management) PhD (Construction Management)	MNIOB 2011 M0001990 CORBON F.1746 (in 2013)	Senior Lecturer
17	Henry AJAELU	BSc (Building) MSc (Construction Management) PhD (Construction Management)		Senior Lecturer
18	Francisca OKEKE	BSc (Building) MSc (Construction Management) PhD (Construction Management)		Senior Lecturer

7.2 TECHNICAL STAFF

S/N	Name	Rank	Qualification
1	Daniel Maduabuchi OKAFOR	Chief Technical Officer	C&G (final),GCE, NTTC, B.Sc. Hons (Bldg)
2	Engr. Nicholas Obiora OZONSI	Chief Technologist	WASC, CECT, B.Eng. Hons (Civil Engineering), M.Eng.
3	Richard Ibiwari ALLEN	Chief Technologist	WASC, OND, HND (Civil Engineering), PGD
4	Venatus Amaechi ANIAGO	Chief Lab. Supervisor	GCE,B.Eng. Hons (Civil Engineering), COREN R.19330, M.Eng.
5	Fredrick Ugochukwu OKORIE	Chief Works Supervisor,	Fed. Craft Cert, C & G Int, GCE, B.Sc.

6	Jonathan Amobi NJOKU	Chief Lab Supervisor	WASC, B. Eng. (Hons)
7	John Uzoigwe EZIMAH	Chief Laboratory Supervisor	WASC, B.Sc. (Hons)
8	Theodore T. OKAGU	Technologist I	WAEC,B.Eng. Hons (Civil Engineering)
9	Ijeoma Chinenye ONUIGBO	Technologist I	WAEC,B.Eng. Hons (Civil Engineering)
10	Amechi Wilson NNAJI	Technologist II	WAEC,B.Eng. Hons (Civil Engineering) M.Eng. (Structures) MNSE 38217, COREN R.36207
11	Sunday Christian OJE	Principal Workshop Supervisor	FSLC, Grade III&II, Grade I
12	Emmanuel Chinonso EZE	Technologist II	WAEC,B.Eng.Hons (Civil Engineering)
13	Nelson Uzochukwu IFEGBUNAM	Technologist II	WAEC,B.Eng.Hons (Civil Engineering)

7.3 ADMINISTRATIVE NON-TEACHING STAFF

S/N	Name of Staff	Rank	Qualification
1	Chukwu UZOIGWE	Chief Executive Officer	B. Sc., GCE, FSLC.
2	Chika ANYANWU	Asst. Chief Executive Officer	SSCE, ASCON, B.Sc., MBA (Bus. Admin)
3	Uchenna Winifed EZE	Principal Executive Officer I	GCE, BSc (Accountancy, ESUT, 2004)
4	Christiana OHANENYE	Principal Laboratory	WASC,GCE,

		Supervisor	B.Sc. Hons (Public Admin)
5	Monica ATAMAH	Senior Lab. Assistant	FLSC, NECO