



Civil Engineering Informatics

Professional Training Program

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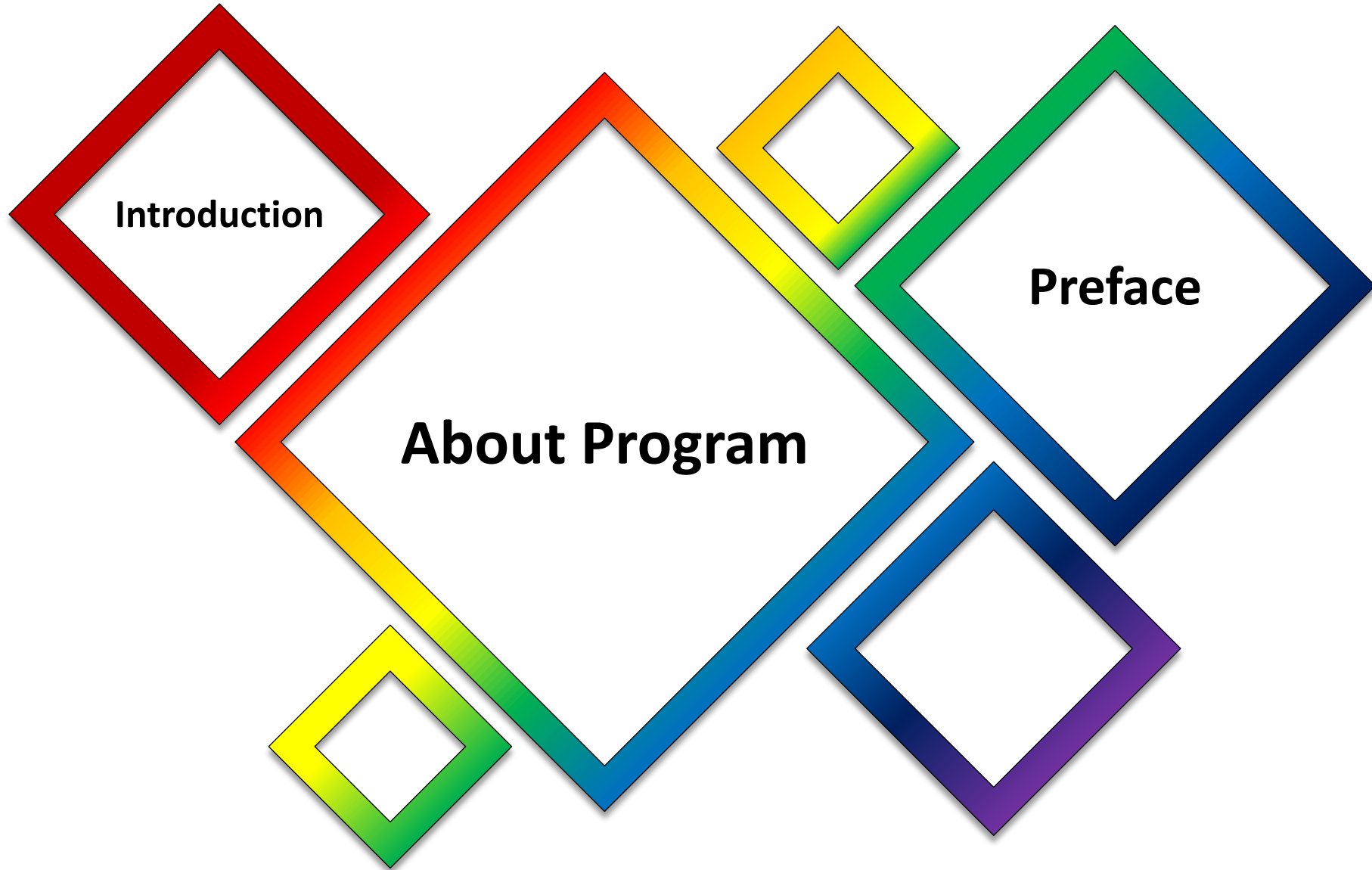
Partnership with Industry

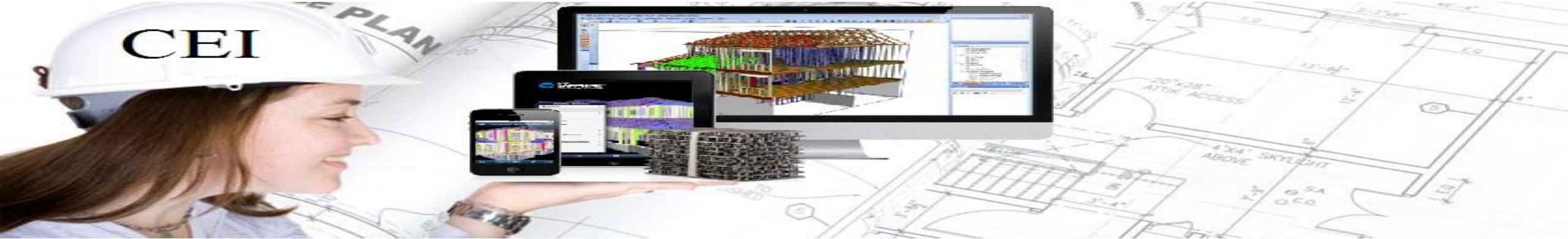
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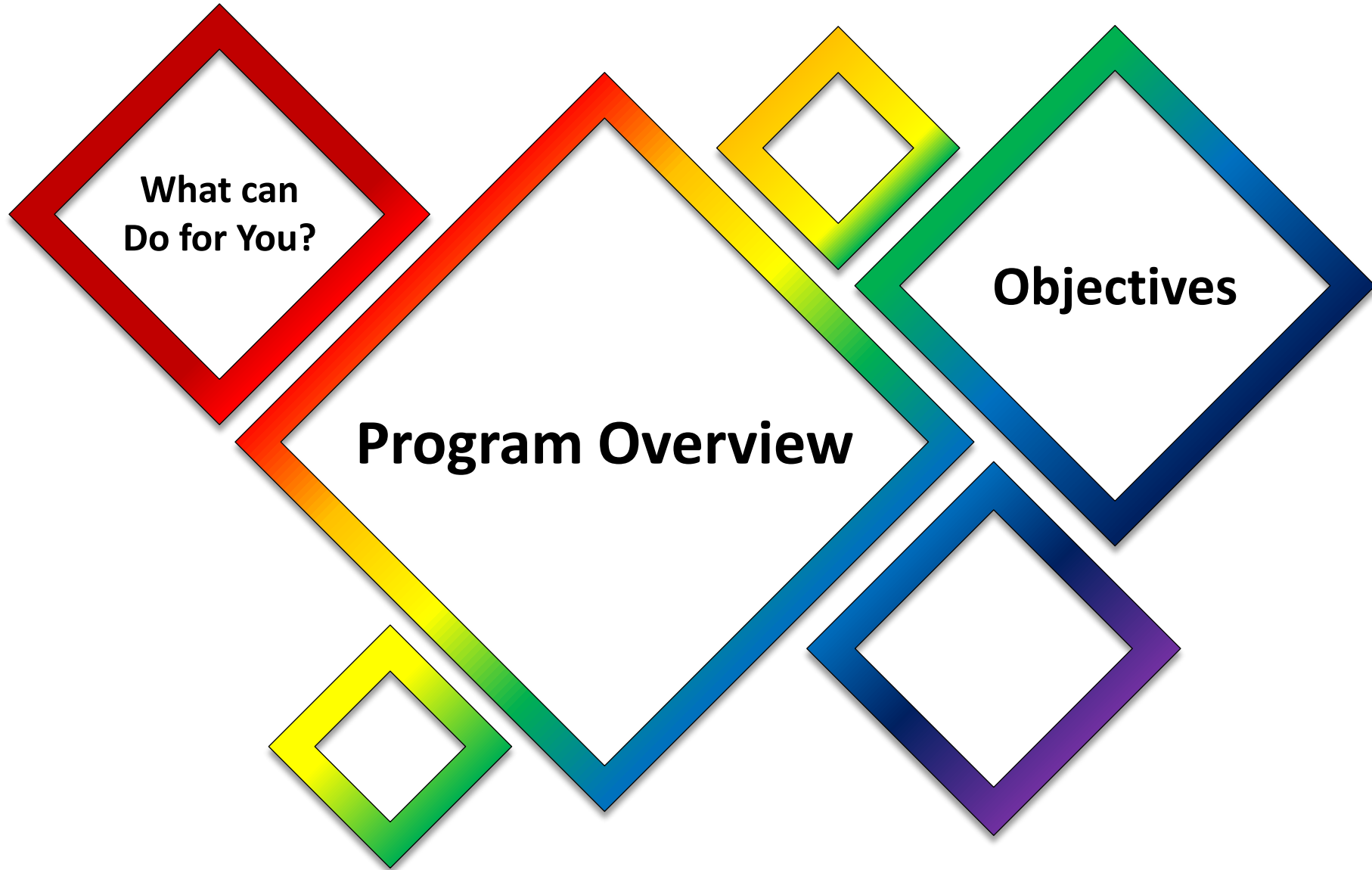
Preface

Civil Engineering Informatics is an interdisciplinary field focusing on the application of Advanced Computing, Information and Communication Technology (ICT) to Civil, Building and Environmental engineering domain, including, but not limited to, BIM, CAD, Construction Information Modeling (CIM), GIS, GPS, VR/AR, visualization, computer-aided construction, product and process modeling, Big Data, cooperative design, HPC, simulation, MAS, structural health monitoring, computer-aided structural control and analysis, ICT in geotechnical engineering, computational mechanics, asset management, maintenance, urban planning, FM, Smart City, BEMS/HEMS, etc.

Introduction

The Civil Engineering Informatics (CEI) training program aims at delivering state-of-the-art Engineering Informatics Professional Engineers with both deep academic knowledge and professional IT/SWE skills to tackle various Computer-Aided Engineering (CAE) areas in the Civil, Building and Environmental engineering domain. The students join this program with bachelor degree in a relevant engineering discipline; civil, architectural, urban planning and environmental engineering. The conducted coursework covers both theoretical and applied aspects of the studied domain. The focus areas include, but not limited to,

- **Computational Engineering:** simulation, visualization, modeling, analysis, design and optimization problems
- **Engineering Project and Production Environment Management:** collaborative project development environment where information is shared and integrated
- **Engineering and Legal Information Management:** developing techniques to facilitate the organization, management and retrieval of engineering data, information and knowledge



Civil Engineering Informatics

is an interdisciplinary field focusing on the application of Advanced Computing, Information and Communication Technology (ICT) to Civil, Building and Environmental engineering.

Program Overview

A learn by doing program that lets you possess the theoretical knowledge and master the applied software development skills with the professional industry experience in order to build real-world engineering problems' solutions using state-of-the-art software development tools and technologies in various fields such as Building Information Modeling (BIM), Computer-Aided Design and Drafting (CAD), computer-aided construction and Construction Information Modeling (CIM), Geographic Information Systems (GIS), Global Positioning Systems (GPS), Virtual Reality and Augmented Reality (VR/AR), High-Performance Computing (HPC), etc.

This Engineering Informatics diploma is a 9-month full-time study program designed to provide broad-based and practice-oriented training to equip students with professional IT competencies and working knowledge in relevant engineering systems (e.g., Civil, Building, Environmental, etc.) and applications for the implementation of IT solutions in the process and manufacturing industries. Hence, the core competency comes from computational and informational science; the subject taken up during this period prepares them towards the next level leading to a professional postgraduate diploma degree.

Civil Engineering Informatics Training Program

Objectives

Generic Competences

The Civil Engineering Informatics Diploma program is aimed at producing graduates who are expert in their major. They should be able to carry on complex work with the basis of certain professional skills including the skill to plan, to execute the activity, to solve the problem with independent responsibility in certain level, to have managerial skills, and to be able to follow the development of knowledge and technology in their field of expertise.

- 1 Applying knowledge in practice.
- 2 Applying knowledge of the subject area and understanding one's own profession.
- 3 Abstract thinking, analysis and synthesis of information.
- 4 Problem solving ability.
- 5 Use of information and communications technologies.

What can Do for You?

Competence in Scientific Computing and Computational Mechanics

- Own strong background in mathematics, physics, and engineering mechanics
- Own strong background in Structural analysis and mechanics, strength of materials, hydraulics
- Able to analyze and solve practical engineering problems

2

Competence in the domain of Software engineering

- Ability to identify the need of software based on analysis and good design for large scale engineering application/system
- Able to develop software under the direction of a software architect
- Qualified skills in knowledge and software implementation and deep understand of the important professional issues as the basis for forming the good character and behavior of a software engineer
- Able to make a solution design appropriate to various application domain by using software engineering approach by integrating the ethic, social matter, law, and economic matters at the same time

4

Domain Specific Competences

Competence in the CAD, BIM and GIS Applications

- Able to use effectively well-known relevant engineering domain CAD/CAM, BIM and GIS systems to automate the engineering practices
- Able to design and implement software to customize from/integrate with existing CAD, BIM and GIS tools to meet a specific business need
- Able to design and implement engineering systems handling visualization, simulation, modeling and prototyping

3

Competence in managerial, leadership & entrepreneurship

- Ability to work individually or in team to develop and produce qualified software together with its artifacts
- Ability to finish the project with the existing problems, find the compromise with the limited cost, time, and knowledge on the running system and organization
- Ability to show the understanding and value of the importance of negotiation, effective work custom, leadership, and good communication to the stakeholders in a certain software engineering environment
- Ability to learn the model, technique, and new technology and to value the importance of continuous professional development



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Who May Apply?

••••• *for*
Civil Engineering Program
Training Program

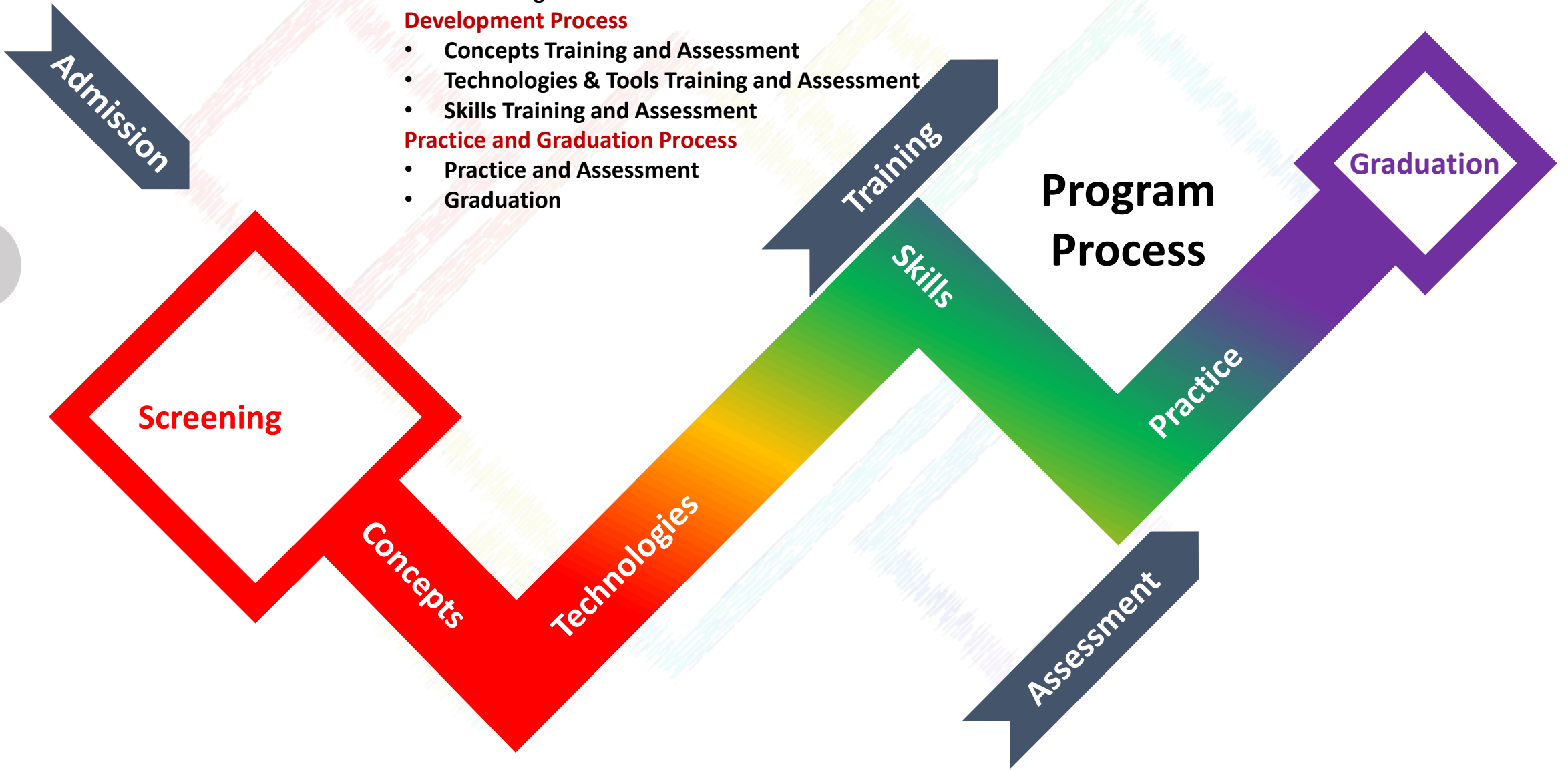
Civil Engineers

Architectural
Engineers

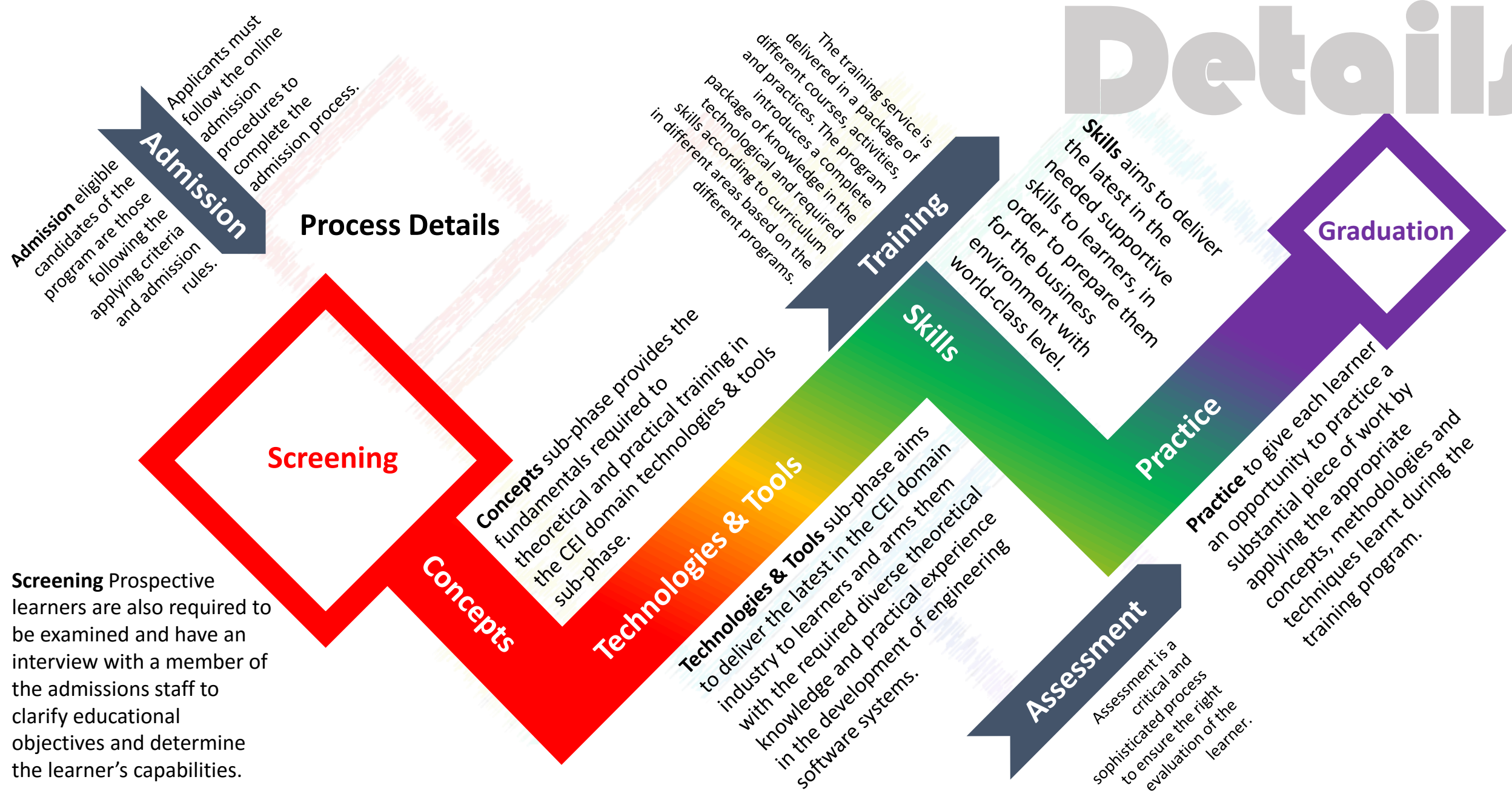
Urban Planning
Engineers

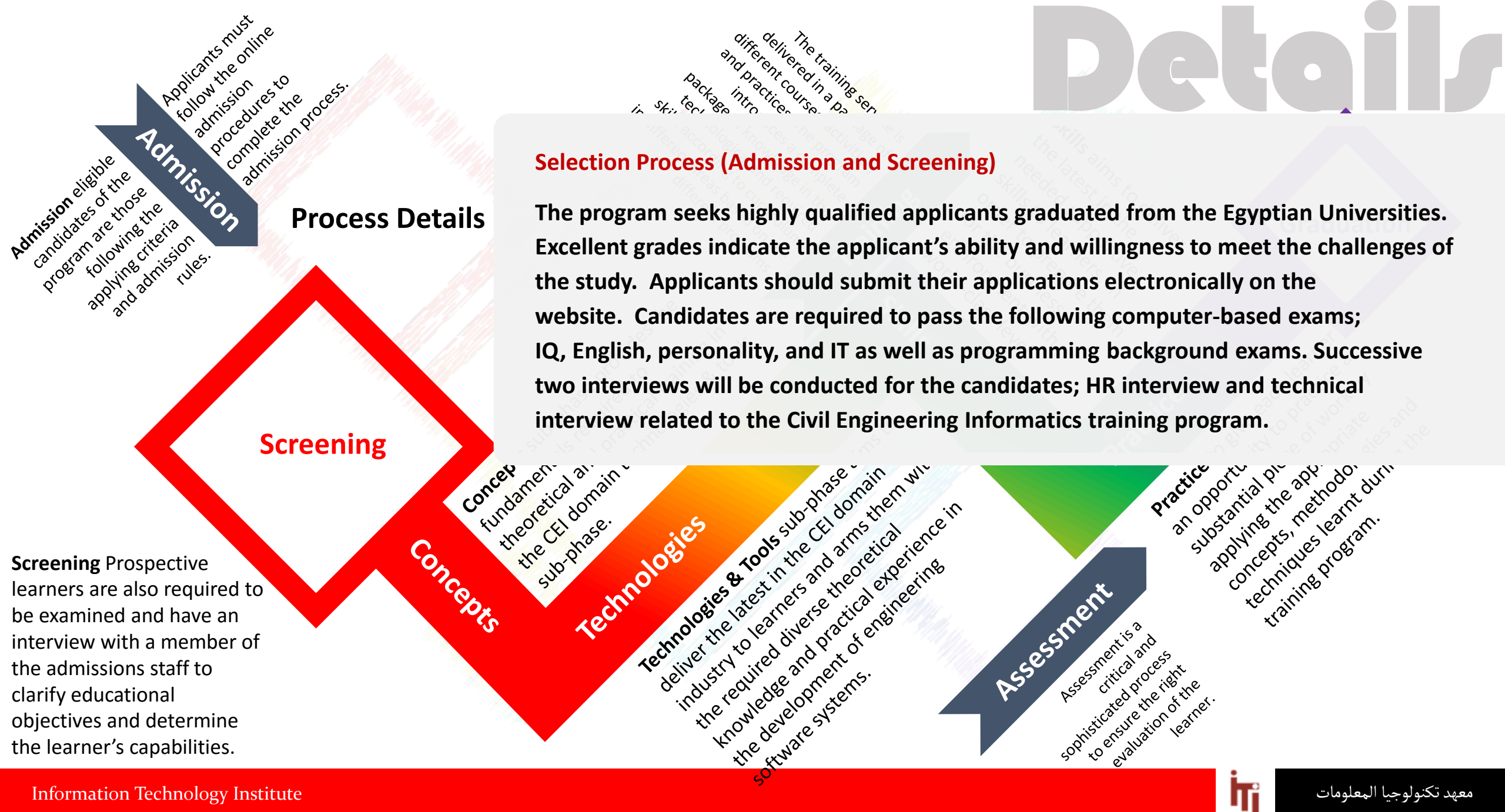
Environmental
Engineers

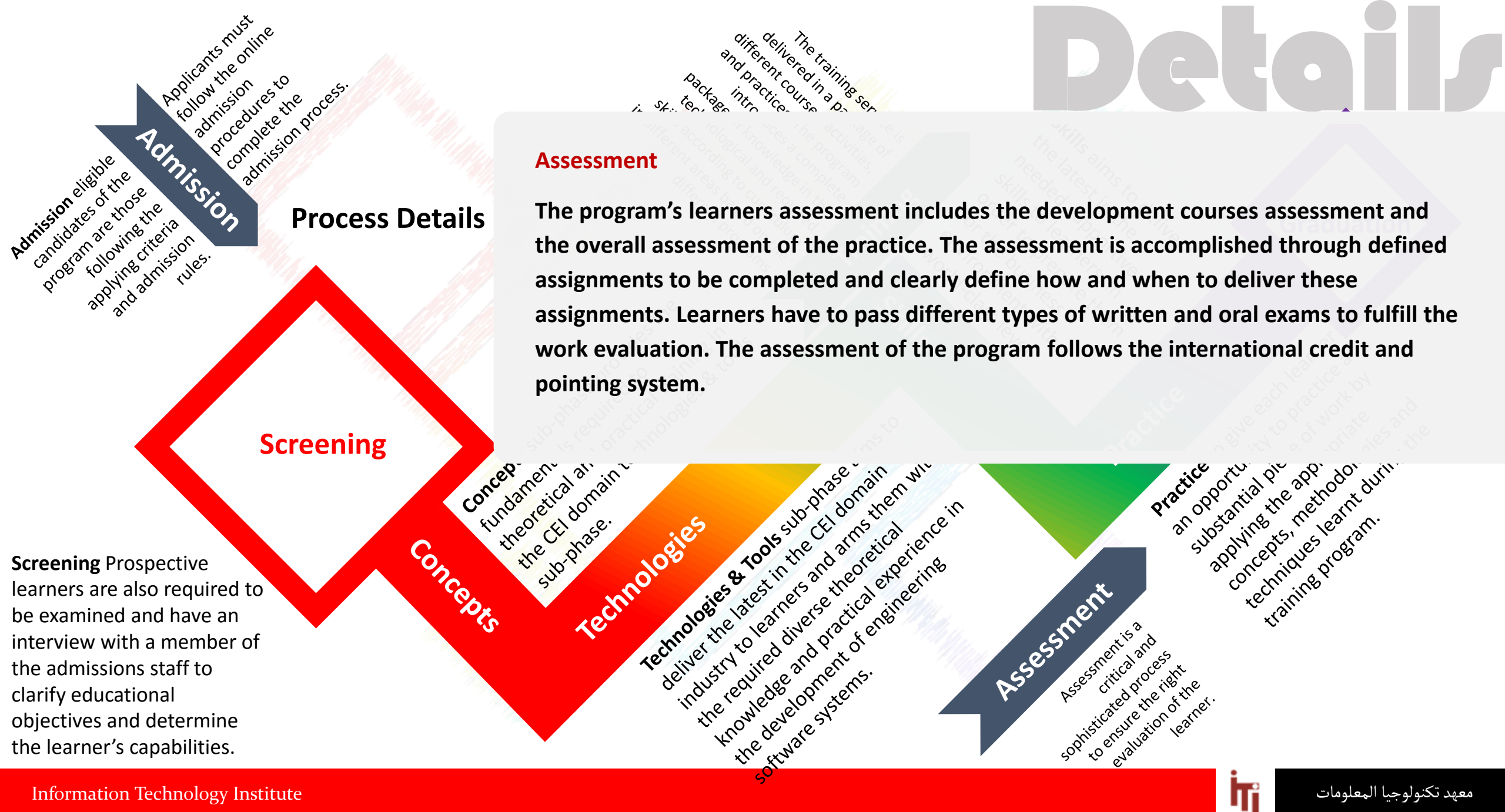
Geotechnical
Engineers

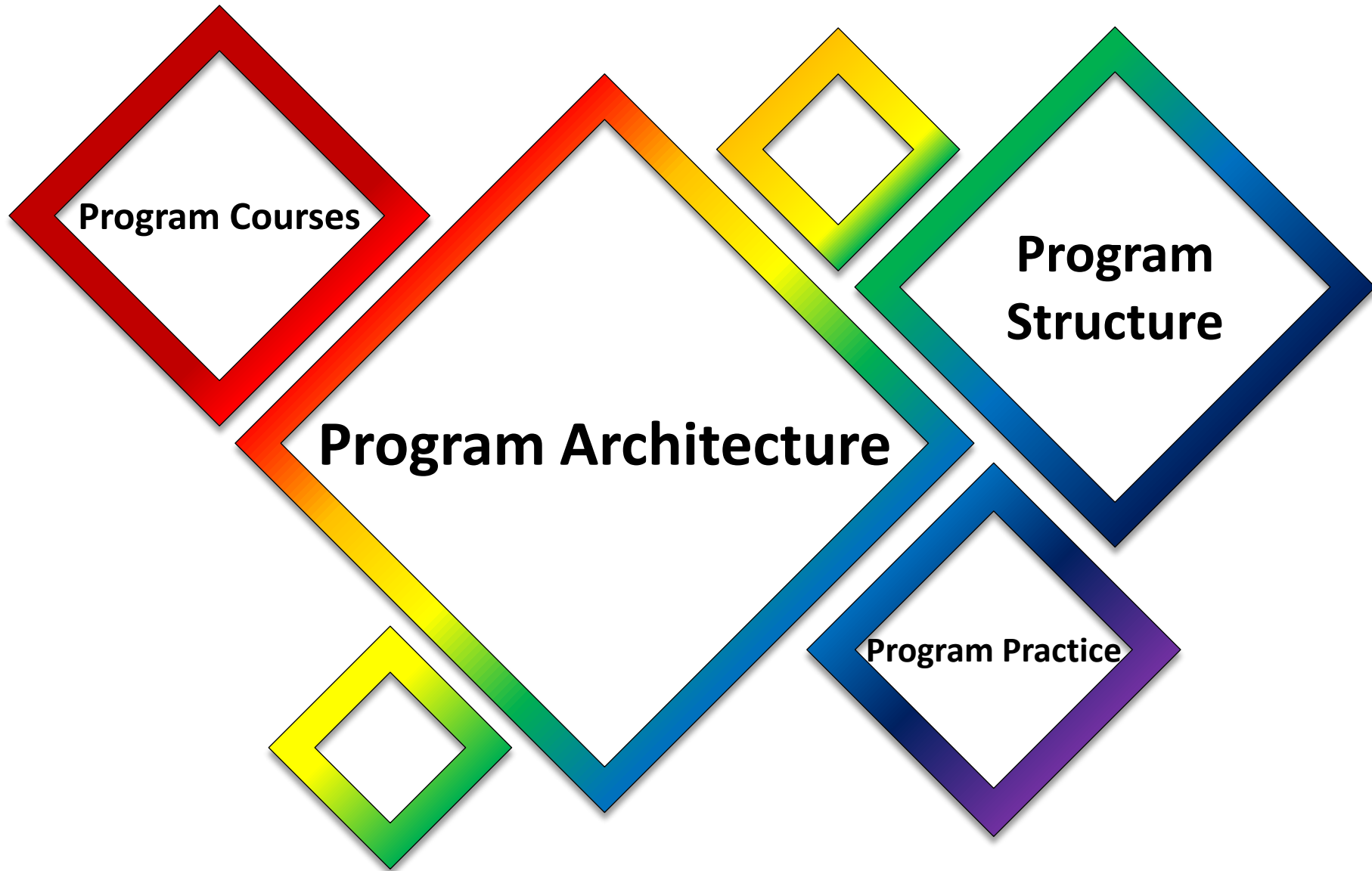


Details









Program Architecture

The Diploma in Engineering Informatics is a 9-month full-time study program designed to provide broad-based and practice-oriented training to equip students with professional IT competencies and working knowledge in relevant engineering systems (e.g., Civil, Building, Environmental, etc.) and applications for the implementation of IT solutions in the process and manufacturing industries. Hence, the core competency comes from both engineering and computational and informational sciences; the subject taken up during this period prepares them towards the next level leading to a professional postgraduate diploma degree.

Domain applied technologies and tools share by more than 22% of the total development load, which focuses on BIM, CAD, CIM, GIS applications and more using different types of tools. Where, IT and state-of-the-art software development methodologies and tools occupies 28% of the development load. The program delivers the latest in the business skills to learners, 13% of the total development load, in order to prepare them for the business environment with world-class level. All of that developed on a strong basis of knowledge and concepts, which shares 37% of the development effort, focusing on computational methods in engineering, scientific computing and computational mechanics skills and advanced engineering skills.

Structure

Program Size
900
Hours

Supportive
Soft Skills **13%**

7%
CS & IT
Essentials

21%
SW Application
Development

13% BIM & CAD
Systems

Programming &
Scientific Computing
28%

9%
Computational
Methods in
Engineering

9%
GIS Systems

Program Structure

Essential Courses in IT and Computer Science aim at laying the necessary common background for the whole learners in order to make sure they all have the minimum ground needed to start in Program. This is followed by Scientific Computing & Software Application Development courses to engage students with real engineering problem solving and computer programming. Then, continuing with domain specific applications courses in BIM, CAD and GIS as well. Finally, the student have to fulfil at least 300 hours of graduation project work on real industry problem, which give learners the practical experience needed for them to be ready to work instantly in market related field.



Program Courses

Program Courses

CS & SWE Essentials

- Operating Systems Fundamentals
- Computer Networks Fundamentals
- Database Fundamentals
- Introduction to Software Engineering

Scientific Computing

- Computer Programming I - Programming Fundamentals with C
- Computer Programming II - Object-Oriented Programming with C++
- Scientific Computing I - Fundamentals
- Scientific Computing II – Applications [Elective]
- Data Structures and Algorithms with C/C++
- Computer Graphics I - Mathematics Foundation
- Computer Graphics II - Programming with OpenGL
- Artificial Intelligence Fundamentals

SW Applications Development

- Computer Programming III- .NET Programming with C#
- Introduction to Web Technologies
- XML Fundamentals
- Client Side Scripting with JavaScript & DHTML
- Server Side Scripting with ASP.NET
- Software Architecture I - Principles, Analysis and Design
- Software Architecture II - Service Oriented Architecture

Computational Methods in Engineering

- Finite Element Method I - Linear Analysis
- Finite Element Method II - Nonlinear Analysis [Elective]
- Structural Dynamics
- Structural Optimization

CAD/CAM & BIM Systems

- Computer-Aided Structural Analysis and Design
- Computer-Aided Drafting and Design I - AutoCAD Essentials
- Computer-Aided Drafting and Design II - AutoCAD API SDK
- Building Information Modeling I - Revit Essentials
- Building Information Modeling II - Revit API SDK

Geospatial Information Systems

- Geographic Information Systems I - ArcGIS Foundation
- Geographic Information Systems II - ArcGIS Building Geodatabases
- Geographic Information Systems III - ArcGIS Programming

Program Courses

Program Courses (continued)

Soft Skills

- Business Report Writing
- Code of Conduct and Corporate Etiquette
- Effective Communication Skills
- Effective Presentation Skills
- Effective Team Management Skills
- Innovative Thinking
- Interviewing Skills
- Marketing Principles

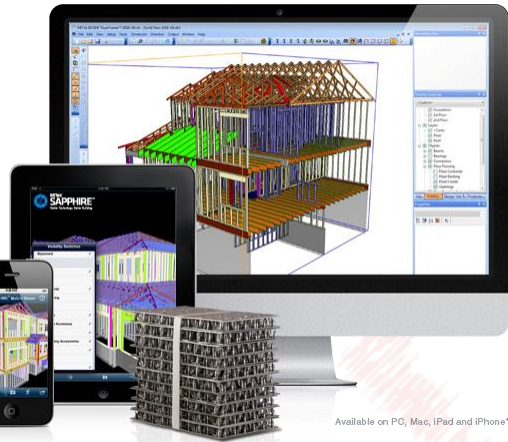
Graduation Project

- The graduation project aims at developing the student professional skills to get him ready to engage the industry as a *Professional Software Developer* in the field of *Engineering Software*.
- The graduation project tasks may involve some *Scientific Research Work*, regarding the project specific problem under consideration. Such research work may be published under the acknowledgement of ITI.

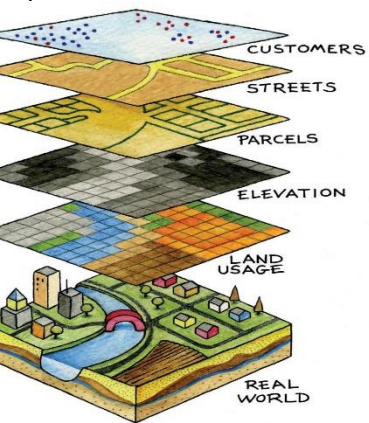


Practice

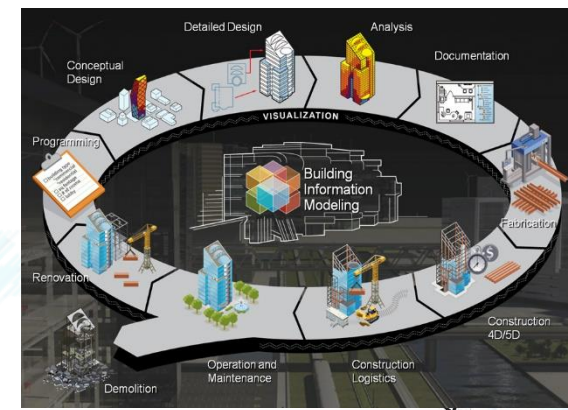
All learners are expected to apply the gained accumulative knowledge by undertaking a major project as a part of the program completion. The aim of this project is to give the learner an opportunity to practice a substantial piece of work by applying the appropriate concepts, methodologies and techniques acquired during the program. For the “On Job Training” conduction case in one of our industrial partners based on the Knowledge Transfer Program, project is supervised and monitored by one of the program staff and the project would be evaluated according to the same rules of the program. Moreover, learners are required to work effectively, independently, and in multi-person teams to Identify, analyze, design and develop practical solutions for engineering systems real problems arising in society.



Computer-aided design (CAD) is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the form of electronic files for print, machining, or other manufacturing operations.



Geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data. The acronym GIS is sometimes used for geographical information science or geospatial information studies to refer to the academic discipline or career of working with geographic information systems and is a large domain within the broader academic discipline of Geoinformatics. What goes beyond a GIS is a spatial data infrastructure, a concept that has no such restrictive boundaries.



Building information modeling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of places. Building information models (BIMs) are files (often but not always in proprietary formats and containing proprietary data) which can be exchanged or networked to support decision-making about a place. Current BIM software is used by individuals, businesses and government agencies who plan, design, construct, operate and maintain diverse physical infrastructures, such as water, wastewater, electricity, gas, refuse and communication utilities, roads, bridges and ports, houses, apartments, schools and shops, offices, factories, warehouses and prisons.

Program Practice

Construction Information Modeling (CIM): BIM in construction management using BIM can bridge the information loss associated with handling a project from design team, to construction team and to building owner/operator, by allowing each group to add to and reference back to all information they acquire during their period of contribution to the BIM model.





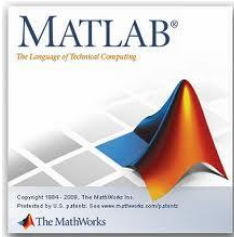
Hardware

- Fully Equipped Training Labs
- Powerful Desktop/Laptop Workstations
- Data Show
- Whiteboard

Learning Environment

The learning knowledge and learning process are integrated well with a special learning environment, which is especially designed for a professional training program

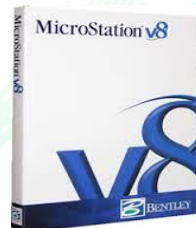
Software



- Operating Systems
 - Microsoft Windows 7/8
 - Ubuntu Linux
- Math & Simulation Tools
 - Mathworks Matlab
- Software Development Tools
 - Microsoft Visual Studio IDE
 - (C/C++, C#, ASP.NET)
 - NetBeans IDE

- CAD/BIM Tools
 - Autodesk AutoCAD
 - Autodesk Revit
 - Bentley Microstation
- GIS Tools
 - ESRI ArcGIS

- CASAD Tools
 - CSI SAP2000
 - CSI ETABS
 - CSI Column
 - CSI SAFE
 - Bentley STAAD Pro





*Capacity Development Enriching
Creative Practicing
World Trends Adoption*

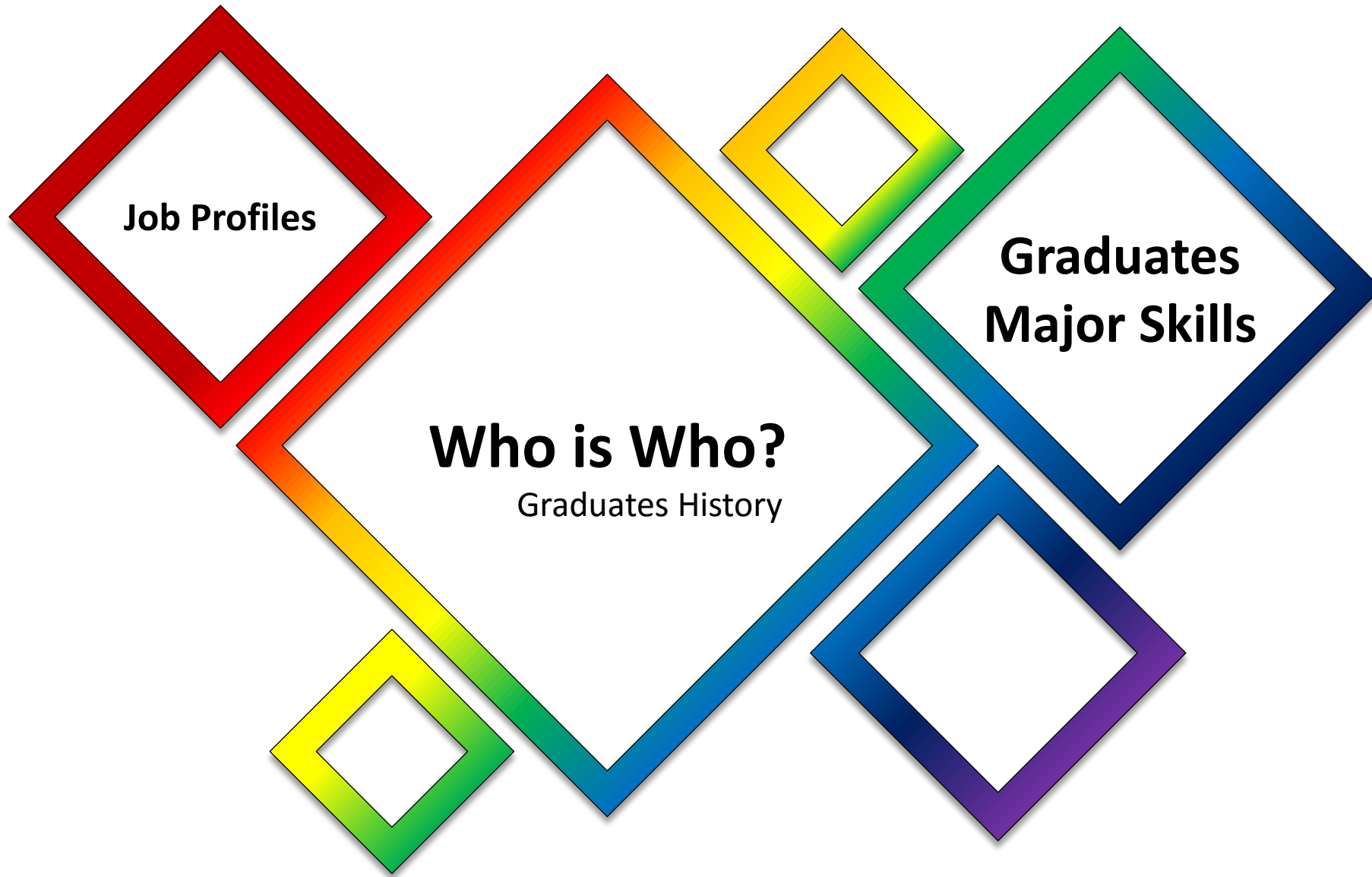


**Partnership
with
Industry**

for



*Capacity Development Enriching
Creative Practicing
World Trends Adoption*



14

graduates

CEI Training Program 1st Intake 2014

Who is Who?

+

12

Current Students

CEI Training Program 2nd Intake 2015

Graduates History

2014

since establishment

1 Analyze, Design and implement engineering software solutions to automate and enhance the productivity of engineering practice posting construction the industry.

Develop CAD, BIM, CIM and GIS and simulation tools to meet different industry-specific requirements.

3 Configure and customize existing well-known commercial CAD, BIM and GIS systems to meet specific customer needs.

Plan and run large scale BIM projects, working as CAD/BIM server coordinator.

5 Master using CAD/BIM tools to carry out various engineering project drafting, design, construction and as built phases.

Conduct advanced engineering research projects in engineering informatics areas such as simulation, visualization, modeling and prototyping, project collaboration services, etc.

2

4

6

Graduates Major Skills



Major Skills

Profiles



Job Profiles

Graduates will have the opportunity to engage with the Software Development Industry, applying for job profiles requiring experience with developing, customizing and administering Scientific and Engineering Software systems for the Structural, Civil, Geotechnical and Environmental Engineering domain.

Engineering Solutions Software Engineer

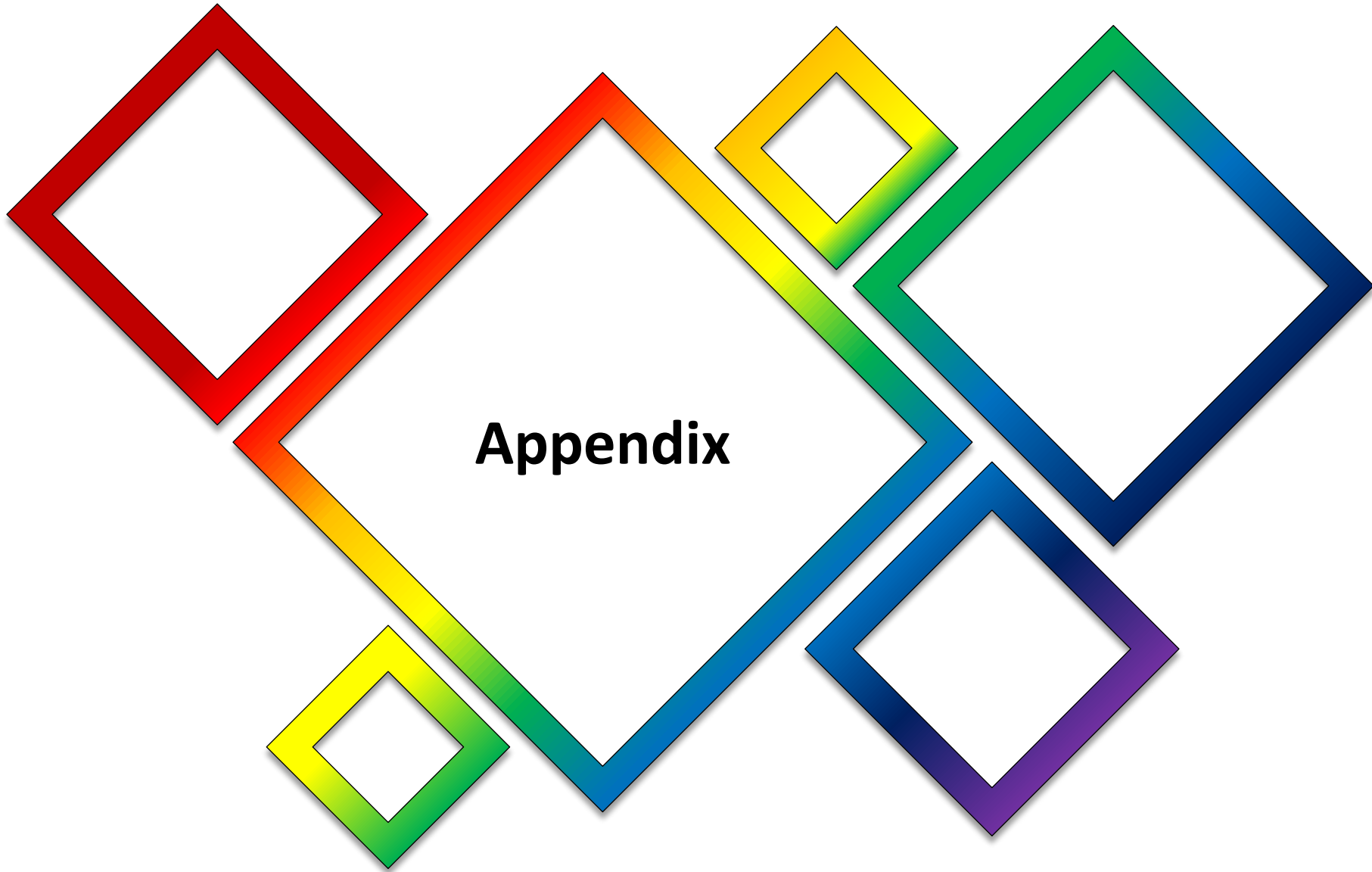
Contributing in different engineering software development project phases from conception to completion. Implementing the process identified for the project. Attending daily & weekly project internal and customer meetings to report on progress. Reporting working hours on weekly basis in his/her timesheet. Contributing with improvement proposals whenever possible.

Chief Engineering Software Solutions Officer

Provide Consultations, technical support and training for the implementation of BIM, CAD/CAM, CIM, GIS and related systems in specialized engineering firms and design offices. Analyze requirements, define solution architecture and manage the in-house development projects to meet structural, civil and geotechnical engineering firms customized needs. Work as BIM coordinator and administrate company's' BIM/CAD and CIM servers.

CAD/BIM Specialist

Assess project requirements and goals as they relate to BIM and CAD. Responsible BIM project set-up and technical administration. Perform project work designing and modeling. Serve as central point of contact for overall BIM project issues for identifying and Resolve project-specific technology issues. Identify customization needs for application software. Develop and promote practices to improve production, efficiency and effectiveness at a project level. Develop, document and maintain BIM / CAD project archiving.



Appendix

Operating Systems Fundamental	18	Software Architecture II - Service Oriented Architecture	18
Computer Networks Fundamentals	21	Finite Element Method I - Linear Analysis	30
Database Fundamentals	27	Finite Element Method II - Nonlinear Analysis [Elective 30]	-
Computer Programming I - Programming Fundamentals with C	60	Structural Dynamics	30
Computer Programming II - Object-Oriented Programming with C++	60	Structural Optimization	30
Scientific Computing I - Fundamentals	30	Computer-Aided Structural Analysis and Design	30
Scientific Computing II – Applications	30	Computer-Aided Drafting and Design I - AutoCAD Essentials	18
Data Structure and Algorithms	24	Computer-Aided Drafting and Design II - AutoCAD API SDK	30
Computer Graphics I - Mathematics Foundation	18	Building Information Modeling I - Revit Essentials	18
Computer Graphics II - Programming with OpenGL	36	Building Information Modeling II - Revit API SDK	30
Artificial Intelligence Fundamentals	18	Geographic Information Systems I - ArcGIS Foundation	36
Computer Programming III - .NET Programming with C#	60	Geographic Information Systems II - ArcGIS Building Geodatabases	18
Introduction to Web Technologies	18	Geographic Information Systems III - ArcGIS Programming	30
XML Fundamentals	18	Soft Skills Package	123
Client Side Scripting with JavaScript & DHTML	30	English Course + Workshops and Seminars	120 + 48
Server Side Scripting with ASP.NET	42	Graduation Project	300
Software Architecture I – Principles, Analysis & Design	18	Total training hours for technical training	1440

Essential IT/CS Category

Operating Systems Fundamentals

Gives basic information about the important concepts of operating systems, process management, memory management, file systems, input/output management and distributed systems.

Computer Networks Fundamentals

The goal of this course is to introduce the students to fundamental networking concepts and technologies. This course provides a hands-on experience on networking and the Internet using tools and hardware commonly found in the home and small business environment.

Database Fundamentals

This course introduces basic concepts for database design. We consider this course basic introduction for different terminologies related to database engineering. Students will learn the main features of different DBMSs in the market. It focuses on building ERD using practical case studies. It explores how to build a relational database from the logical database design. This course covers how to design, build and query a relational database. They will apply normalization to data for effective, stable database design.

Introduction to Software Engineering

This course is designed for students who have no previous SWE experience with enough materials to allow students get started on projects also there is a part for intermediate topics. The course defines different development model and how to be integrated together , different software processes specification, development, validation and how to make use of them Mainly the course gives all general knowledge required to run software development project. It helps student to think out of the box and arrange their ideas.

Scientific Computing Category

Computer Programming I - Programming Fundamentals with C

This course teaches fundamental concepts and terminology of computer programming using C Programming Language. There is an emphasis on both the principles and practice of modular structured computer programming. It covers principles of problem solving by computer and requires completion of a number of programming assignments intended for preparing engineering students to computer programming for scientific and engineering applications. By completing this course, students will develop all the necessary skills to design, code, test and debug computer programs written in C. The course requires no previous programming background.

Computer Programming II - Object-Oriented Programming with C++

This course teaches key concepts and terminology of Object-Oriented Programming using C++ Programming Language. Key topics include data abstraction, classes, objects, methods, interfaces, packages, inheritance, encapsulation, and polymorphism. These concepts are emphasized through extensive programming examples and assignments that require problem solving, algorithm development, top-down design, modular programming, debugging, and testing. Examples and programming assignments of this course are intended for preparing engineering students to computer programming for scientific and engineering applications. The course also covers introduction to using the UML modeling language for documenting object-oriented design diagrams. By completing this course, students will develop all the necessary skills to model real world problems in object-oriented design diagrams using UML diagrams and implement them in C++ programs. The course requires previous computer programming background in C.

Scientific Computing I - Fundamentals

This is a computer programming intensive course intended to introduce and study fundamentals of software issues related to scientific computing for scientific and engineering applications. The course will discuss mathematical principles and algorithms, and also practical issues of reliability, library use, and performance on modern hardware. Topics include floating-point computations, numerical errors, interpolation, integration, solution of linear systems of equations, optimization, initial-value problems of ordinary differential equations, and matrix and vector computations. Implementation of algorithms will be investigated using C++ Programming Language as well as Matlab. Examples will be drawn from a variety of scientific and mathematical areas. The course requires adequate academic background in science or engineering with solid knowledge of mathematics, calculus and numerical methods as well as previous programming background in C/C++.

Scientific Computing II - Applications

This is a computer programming intensive course intended to introduce and study a number of real world applications related to the students field of work. Topics included software implementation of finite element analysis, computer structural analysis and design programs, etc. By the end of this course the student should be able to analyze requirements, design and practically implement real world scientific problems into a working software solutions; each student is required to develop a small software application that handles one of the topics discussed during the course to demonstrate his/her ability to implement scientific software applicaitons.

Artificial Intelligence Fundamentals

This course is an introduction to the basic principles, techniques, and applications of Artificial Intelligence. Coverage includes knowledge representation, logic, inference, problem solving, search algorithms, game theory, perception, learning, planning, and agent design. Students will experience programming in AI language tools. Potential areas of further exploration include expert systems, evolutionary algorithms, neural networks, fuzzy logic, robotics, natural language processing, and computer vision. This course requires students to be familiar with computers and to have basic knowledge in computer programming, preferably with C or Matlab.

Data Structures and Algorithms

Students learn, in a comprehensive approach, the concepts of design and implementation of data types and how to create new data structures. Students acquire a good knowledge about the simple and famous algorithms used in computerized systems, like Sorting and Searching. In addition, they will learn how to work with Linked List, Binary Trees. Specification.

Computer Graphics I – Mathematics Foundation

The aim of the course is to introduce students to the area of computer graphics and vision. It discusses hardware and software principles of interactive 2D and 3D raster graphics and focuses on mathematical foundations of scientific visualization, computer graphics, and massive data exploration. Topics covered in this course explain a wide range of mathematical techniques and problem-solving strategies associated with computer games, computer animation, virtual reality, CAD, and other areas of computer graphics. Students will use a standard computer graphics API as well as OpenGL to reinforce concepts and study fundamental computer graphics algorithms. This course requires previous background in C/C++ computer programming and mathematics.

Computer Graphics II – Programming with OpenGL

This course is aimed at students who have completed the course Computer Graphics I or have knowledge comparable to this course. The primary goal of this course is to teach students development of graphical applications using common graphics libraries such as OpenGL and/or DirectX. To fulfill this goal it is necessary to understand the theoretical principles of computer graphics and be able to apply them during development. This is a computer programming intensive course and requires strong background in C/C++ programming languages.

Software Applications Development

Computer Programming III - .NET Programming with C#

This course teaches students the skills that are required to design and develop object-oriented Windows applications using Microsoft Visual C# language and the .NET Framework. The course first introduces the .NET Framework and describes the basics of C# program structure, language syntax, and implementation details, and then the course moves on to cover the major topics for Windows client application programming on the .NET Framework. These topics include: Windows Forms, GDI+, simple data access, interoperating with unmanaged code, threading and asynchronous programming issues, simple remoting, Web access, Web Services consumption, debugging, security, and deployment issues for desktop applications. This is an advanced computer programming course that requires strong object-oriented programming background.

Introduction to Web Technologies

This course provides students with an introduction to website development technologies using, typically, HTML and other state-of-the-art techniques.

XML Fundamentals

To fully understand the purpose, structure, and application of XML. To get substantial hands-on experience in creating XML documents. To understand how XML and its related technologies enable the web programmer to accomplish what has been very hard or even impossible to do with previous languages such as HTML. To validate a content model of XML by schema or DTD. To become proficient in using related languages like XSL, XLink, XPath and XPointer and how they add more power to XML. To become familiar with the relationship between the various XML applications. To understand how XML is revolutionizing the web and what it will do for complex, real world applications.

Client Side Scripting with JavaScript & DHTML

JavaScript is an object based script language that can be used add interactivity to HTML pages. DHTML is the art of using JavaScript to access and manipulate the CSS properties of the browser's objects in order to create colorful user-interactive dynamic.

Server Side Scripting with ASP.NET

ASP+ (also called ASP.NET), is the next generation of Microsoft's Active Server Page (ASP), a feature of their Internet Information Server (IIS). Both ASP and ASP+ allow a Web site builder to dynamically build Web pages on the fly by inserting queries to a relational database in the Web page. ASP+ is different than its predecessor in two major ways: it supports code written in compiled languages such as Visual Basic, C++, C#, and Perl, and it features server controls that can separate the code from the content, allowing WYSIWYG editing of pages. Although ASP+ is not backwards compatible with ASP, it is able to run side by side with ASP applications. ASP+ files can be recognized by their .aspx extension.

Software Architecture I – Principles, Analysis & Design

XXXXXXXXXXXXXXXXXXXXXXXX standard and have been popular with the traditional enterprises. In such systems, there is often a machine-readable description of the operations offered by the service written in the Web Services Description Language (WSDL). The latter is not a requirement of a SOAP endpoint, but it is a prerequisite for automated client-side code generation in many Java and .NET SOAP frameworks (frameworks such as Apache Axis2, Apache CXF, Spring, gSOAP being notable exceptions).

Software Architecture II - Service Oriented Architecture

XML web services use Extensible Markup Language (XML) messages that follow the SOAP standard and have been popular with the traditional enterprises. In such systems, there is often a machine-readable description of the operations offered by the service written in the Web Services Description Language (WSDL). The latter is not a requirement of a SOAP endpoint, but it is a prerequisite for automated client-side code generation in many Java and .NET SOAP frameworks (frameworks such as Apache Axis2, Apache CXF, Spring, gSOAP being notable exceptions).

Computational Methods in Engineering Category

Finite Element Method I - Linear Analysis

This course introduces the theory and implementation of the analysis procedures used in the linear, static, and dynamic finite element analysis systems of solids and structures. Continuum mechanics formulations of one-two- and three-dimensional elements are reviewed, and plate and shell elements formulations are presented in detail. A selected number of equation and eigenvalue solvers are compared. Applications will include plates and shells, linear buckling, structural dynamics and thermal field problems. Introduction to nonlinear systems will be presented.

Finite Element Method II - Nonlinear Analysis [Elective]

This course introduces the theory and implementation of the analysis procedures used in geometric and material nonlinear finite element analysis systems of solids and structures. Problems in plasticity, impact, contact and viscoelasticity are treated. Numerical solutions pertinent to nonlinear systems are explored. Various topics and algorithms such as the reduce integration, hour-glass and Arc Length Automatic Stepping method are also reviewed. The students examine the above concepts by exploring a set of industrial applications.

Structural Dynamics

This course covers fundamental analysis methods for the behavior of structures and structural elements subjected to dynamic loading. Comprehensive study of single-degree-of-freedom systems followed by solution of multi-degree-of-freedom systems with particular reference to response of multi-story structures to earthquake loading is covered. An introduction to random response and stochastic analysis of structural dynamics problems are also given.

Structural Optimization

This course teaches the key concepts and mathematical formulation of the optimization problem in conjunction with its applications to civil and structural engineering design problems. Optimization methods have been developed for solving different types of optimization problems. In this respect, the problem of finding the 'optimal' design is considered. The term 'optimal' design can apply to various aspects and the common features are minimum weight or maximum stiffness of a structure. Topics covered include Formulation & solution for linear programming problems, unconstrained & constrained nonlinear optimization problems. Optimization of structures using finite element method. Sensitivity analysis of discrete systems; sensitivity analysis of distributed systems; dual methods for constrained optimization; optimization decomposition, multi-level optimization; Also, artificial intelligence optimization techniques such as Evolutionary search algorithms, Multi objective optimization are briefly introduced, and recent developments in engineering optimization are pointed out.

Selected Topics in Engineering Informatics [Elective]

This course aim to expose students to emerging technologies and research directions in the field of engineering informatics. This is a research oriented seminars class, different from a typical lecture discussion class. In this course students will study and discuss papers on a variety of topics related to engineering informatics. They will join a seminar group, typically of three to four students. Each seminar group will do an in-depth study on a specific topic by reading and analyzing published research papers in journals and conference proceedings, etc. and, based on this research, they will present a seminar on that topic and submit a research paper.

CAD/BIM Systems Category

Computer-Aided Structural Analysis and Design

This course teaches students the basic concepts, and techniques to develop new, or customize existing Computer-Aided Structural Analysis and Design (CASAD) and related systems. The course objective is demonstrated through using CSI SAP2000 API SDK with C# to demonstrate how to create customized CASAD applications and Add-Ins for SAP2000. Also, the course introduced how to develop stand-alone CASAD applications using C/C++ as computationally powerful programming languages. The course requires adequate academic background in science or engineering with specialization in Civil, Architecture, or equivalent engineering disciplines as well as strong object-oriented programming background in C# .NET.

Computer-Aided Drafting and Design I - AutoCAD Essentials

This course teaches students the core Computer-Aided Drafting and Design and (CAD) concepts, standards and techniques that engineers need to produce architectural and structural drawings in Autodesk AutoCAD Architecture/Structure. The course requires adequate academic background in science or engineering with specialization in Civil, Architecture, or equivalent engineering disciplines.

Computer-Aided Drafting and Design II - AutoCAD API SDK

This course teaches students the basic concepts, and techniques to develop new, or customize existing Computer-Aided Design and Drafting (CAD) and related systems. The course objective is demonstrated through using Autodesk AutoCAD API SDK to demonstrate how to create customized CAD applications and Add-Ins. The course requires adequate academic background in science or engineering with specialization in Civil, Architecture, or equivalent engineering disciplines as well as strong object-oriented programming background in C# .NET.

Computer-Aided Drafting and Design II - AutoCAD API SDK

This course teaches students the basic concepts, and techniques to develop new, or customize existing Computer-Aided Design and Drafting (CAD) and related systems. The course objective is demonstrated through using Autodesk AutoCAD API SDK to demonstrate how to create customized CAD applications and Add-Ins. The course requires adequate academic background in science or engineering with specialization in Civil, Architecture, or equivalent engineering disciplines as well as strong object-oriented programming background in C# .NET.

Building Information Modeling I - Revit Essentials

This course teaches students the core Building Information Modeling (BIM) concepts, standards and techniques that engineers need to complete solid architectural and structural projects in Autodesk Revit Architecture/Structure. The course requires adequate academic background in science or engineering with specialization in Civil, Architecture, or equivalent engineering disciplines.

Building Information Modeling II - Revit API SDK

This course teaches students the basic concepts, and techniques to develop new, or customize existing Building Information Modeling (BIM) and related systems. The course objective is demonstrated through using Autodesk Revit API SDK to demonstrate how to create customized BIM applications and Add-Ins. The course requires adequate academic background in science or engineering with specialization in Civil, Architecture, or equivalent engineering disciplines as well as strong object-oriented programming background in C# .NET.

Geospatial Information Systems Category Category

Geographic Information Systems I - ArcGIS Foundation

This course teaches what GIS is and what you can do with it. Working with various components of the ArcGIS system, you will create GIS maps, explore and analyze the data behind the maps, and apply methods to easily share your maps. By the end of the course, you will have a solid understanding of how GIS maps and ArcGIS tools are used to visualize real-world features, discover patterns, obtain information, and communicate that information to others.

Geographic Information Systems II - ArcGIS Building Geodatabases

This course teaches the essential concepts needed to efficiently create a geodatabase, add data to it, and realistically model the real-world spatial relationships inherent to your data. You will learn about unique geodatabase features that help ensure data integrity over time and see why the geodatabase is the preferred format for storing and managing geographic data. Course concepts apply to file-based and multiuser geodatabases. This course is taught using ArcGIS for Desktop Advanced.

Geographic Information Systems III - ArcGIS Programming

This course teaches how to get started using the new ArcGIS Runtime Software Development Kit (SDK) environment to create Add-ins, lightweight applications that feature rich, interactive maps and GIS tasks for the desktop and web. You will learn the ArcGIS Runtime SDK architecture and supported functionality, then apply that knowledge to build an application that allows desktop users to work with local and online geographic data and services. Licensing considerations and best practices for application deployment are also covered. Course exercises can be completed using C# or Visual Basic .NET.

Graduation Project

Final Project

Final project idea will be introduced at the beginning of the course as a part of our strategy in the concept of project based training. We accept the innovative idea from students in the related industries . The students will start to work starting from day 1 and the final part will be about integrating and testing of project component. The project must make use of tools, techniques, experience and courses addressed during the track

Soft Skills Category

Effective Communication Skills

Good communication skills are skills that facilitate people to communicate effectively with one another. Effective communication skills are essential for success in most jobs. Effective communication engages the choice of the best communications channel, the technical know-how to use the channel, the presentation of information to the target audience, and the skill to understand responses received from others. Great communicators know how to assess an audience, analyze a situation, and frame a discussion.

Self-development, interpersonal skills, mutual understanding, mutual cooperation and trust is also important to set a complete channel of most effective and winning communication skills.

Effective Presentation Skills

Effective presentation skills are very important to advance your ideas as well as your career. Great content means nothing if it is not packaged and presented in an engaging way. The course provides a systematic and proven strategy for organizing your ideas and information for greatest impact while presenting, and for building strong audience rapport while persuading and influencing to gain acceptance of proposals or new ideas. Carefully planned and executed, this approach delivers an irresistible call to action. The course focuses on instruction and practice in organization, presentation structure, delivery skills, visual design and use, and question-and-answer techniques. Participants will receive personalized, confidential presentation feedback from the instructor.

Team Building

Great products and services are made and delivered by great teams. The cooperative atmosphere, the ease of achieving big results and the sense of significance of belonging to a successful team is very appealing.

Effective teams usually produce first-rate results, to achieve that, team members must develop their interactive, communication, reducing conflict, sharing and interpersonal skills.

This course intends to increase the students' knowledge and skill levels in team building and team working skills. Gain skills using methods, techniques and tools, which will improve the team effectiveness and the organization performance.

Marketing Management

This course addresses how to design and implement the best combination of marketing efforts to carry out a firm's strategy in its target markets. Specifically, this course seeks to develop the student's (1) understanding of how the firm can benefit by creating and delivering value to its customers, and stakeholders, and (2) skills in applying the analytical concepts and tools of marketing to such decisions as segmentation and targeting, branding, pricing, distribution, and promotion. The course uses lectures and discussions, assignments and student presentations to achieve these objectives.

Interviewing Skills

This course exposes students to effective job search techniques with composition of resumes, cover letters and reference sheets, focuses on the pre-interview and interview techniques, and post-interview follow up. The course is designed to enhance students' current interviewing skills, examining techniques to ensure proper interview preparation and increased personal effectiveness. By understanding the different possible elements to interviews and examining what interviewers are looking for, students can identify how their strengths and experience can meet the interview criteria.

Leadership and Motivation

Leadership is a complex process by which the leader influences others to perform and achieve. The leadership attributes – belief, values, ethics, character, knowledge, and skills – are all traits, which can be learned. This course intends to enable students appreciate the role of effective leadership and motivation skills in enhancing organization's good performance. It will increase their knowledge base about the study of leadership, and enhance their leadership skills through the review of leadership concepts and theories, the assessment of leaders in action through the examination of effective leadership styles. Also the course focuses on the position, functions, responsibilities and roles of leaders in the modern organizations; Essential qualities and abilities of good leaders.

Time and Stress Management

Getting the most out of a 24-hour day is a constant challenge in our busy world: a bottomless inbox, tons of reports and emails, millions of meetings and tasks. Too much to do and not enough time to do it is a common problem many people face in the workplace. Although we can't give you more hours in the day, the course can teach you how to decide what to do and when to do it. The course explains the fundamentals of time management: understanding the value of time, using proven ways to get the most out of a day, prioritizing, balancing work and personal life, planning and scheduling, eliminating time wasters, conquering procrastination, and more.

Creative Thinking

The course is designed to teach students' the processes of creative thinking, using a tool-kit of practical creativity techniques, relative to Types of Thinking, Creativity Elements and Creative problem solving. The course helps the students to gain good knowledge about Brainstorming, 6-Thinkning hats, Mind Mapping, SCAMPER Technique, Problem solving approaches and the traits of creative people. Participants will enhance their existing creative thinking skills by practicing the above tools and techniques.



Civil Engineering Informatics

Professional Training Program