Deputy of training

Plan and curriculums office

Job Training standard

Title

Matrix Structural Analysis & Dynamics using SAP2000

Occupational Group

Information Technology (IT)

International Code

2523-53-132-1

Date of standard compilation :2016/1/1

Control of board on content compilation and accreditation: Plan and curriculums office

National code: **2523-53-132-1**

Member of Specialized commission IT Curriculum development:
-Ali Mosavi: Iran TVTO Curriculum Development Office
-Abdol Rasool Kazerooni: Director Manager of Bousher TVTO
-Rahim Karami: Member of Bousher TVTO Curriculum Development
-Hassan Solimany: Member of Iran TVTO IT Curriculum Development
-Sarang Ghorbanian: Member of Iran TVTO IT Curriculum Development
-Dariush Esmaeili: Member of Iran TVTO IT Curriculum Development
-Ziba Yavari: Member of Iran TVTO IT Curriculum Development
-Shahram Shokofian: Manager of Iran TVTO IT Curriculum Development

Cooperator Specialized organizations for compiling the training standard :
- Bousher Technical and Vocational Training Organization

Revision Process:

- Scientific content
- According to market
- Equipment
- Tools

Plan & Curriculum Office

97, nosrat avenue –Tehran, Iran

Tel:+98-21-66569900-9

Fax: +98-21-66944117

E-mail:Barnamehdarci@yahoo.com

	Name & family name	Academic document	field	Job & post	Relevant experiences
1	**Hani Forouzani**	**M.Sc.**	**Civil Engineering**	**Structural Engineer**	**Bousher TVTO**
2	Rahim Armand	**M.Sc.**	**Civil Engineering**	**Structural Engineer**	**Bousher TVTO**
3	Rahim Karami	**Phd**	**Mechanic Structural Engineer**	**Research Expert TVTO**	**Bousher TVTO**
4	Farahnaz Saeedi	**M.Sc.**	**IT Engineering**	**IT Instructor**	**Bousher TVTO**
5	Hamid Reza Izad Bakhsh	**M.Sc.**	**Civil Engineering**	**Structural Engineer**	**Bousher TVTO**

Definitions:

Job standard:

The characteristics ' required competencies and abilities for Efficient Performance in work environment is called "the Job standard", and sometimes "The Occupational standard"

Training standard:

The Training Map for achieving the Job's subset Competencies.

Job title:

Is a set of Tasks and Abilities which is expected from an employed person in the defined level

Job description:

A statement covering the most important elements of a job, namely the position or title of the job, the duties, job's relation with other jobs in a occupational field, the responsibilities, workplace conditions and required performance standards.

Course duration:

The minimum of time which is required to achieve the training objects.

Admission requirements:

The minimum of competencies and abilities which are obligatory for a potential admission.

Evaluation:

The process of collecting evidence and judgment about wetter a competency is achieved or not. Include: written examination, practical examination

Required Qualifications for Trainers**:**

The minimum of Trainer's technical and vocational abilities which the trainer is required to have.

Competency:

The ability of efficient performing a duty in a variety of workplaces conditions

Knowledge:

The minimum set of facts and mental capacities which is necessary for achieving a competency. This can include science, (Mathematics, physics, chemistry or biology), technology or technical.

Skill:

The minimum coordination between mind and body for achieving an ability or competency. It normally applied to practical skills.

Attitude:

A set of emotional behaviors required for achieving a competency and can have non-technical skills and occupational ethics.

Safety:

The cases which doing or not doing something can cause harm or accident

Environmental Consideration:

A set of consideration about the act which should be done to minimize the environmental damage or pollution.

Job Title:
Matrix Structural Analysis & Dynamics using SAP2000

Job Description:

Professional analyst have attained the knowledge by Matrix Structural Analysis & Dynamics using SAP2000certificate to equally be able to analyze structures subjected to static or dynamic load and be able to master advance subjects in structures with greater interest and ease, having been exposed in their undergraduate studies to an integrated approach in structural analysis. This competency is organized to introduce and acquainted the students with following aspect.

- Analysis of beam under static or dynamic loads

    Formulae of the Equivalent Nodal Forces for beam under same common loading.

    Analytical expression of the lateral displacement of fixed end beam with some common loading conditions.

    Evaluate the lateral displacement in beams resulting from nodal displacement and from loads applied on span of beam.

- Software documentation and commands in SAP2000

- Analysis of frame type structures

    Plane Frame
    Grid Frame
    Space Frame

- Analysis of Trusses type structures

    Plane Trusses
    Grid Trusses

- Finite Element Method of Analysis as a natural extension of Matrix

- Analysis of Plane Elasticity Problems for plates with force applied on their plane as well as plate bending

- Analysis of plate with forces normal to the plane of the plate

- Presentation of the fundamentals of theatrical dynamics, respectively, for structures modeled as single degree of freedom system and for structures modeled with multi degree of freedom systems.

Admission Requirements:

Minimum Degree of Education: Mechanical and Civil Engineering or Computer or IT or similar

Minimum Physical And Mental Ability: Working With Computer

Prerequisite Skills: -

Course Duration:

Course Duration : 90 Hours

 -Theoretical:30 Hours

-Practical:60 Hours

-Apprenticeship:… Hours

-Project:… Hours

IRANTVTO Evaluation :(%)

Written Examination:25%

Practical Examination:65%

Ethics:10%

Required Qualifications for Trainers:

SAP2000 degree holder

Computer or IT or Mechanical and Civil Engineering Instructor With 2 Years' Experience

Job Training Standard

Competency

	Title
1	**Beams: Structural Analysis**
2	**Beams: Structural Dynamics**
3	**Beams: Computer Applications**
4	**Analysis of Plane Frames**
5	**Analysis of Grid Frames**
6	**Analysis of Space Frames**
7	**Analysis of Plane Trusses**
8	**Analysis of Space Trusses**
9	**Introduction to Finite Element Method**

Training standard
Contents analysis form

Title:	time			
	theoretical	practical	total	
Beams: Structural Analysis	Determined by the instructor			
Knowledge ,skill ,attitude ,safety, Environmental Consideration				Equipments ,tools, materials ,books
Knowledge and Skill: - Identify the elements, nodes and nodal coordinates - Determine shape functions and stiffness coefficients - Calculate and assemble element stiffness matrix - Calculate system nodal displacements and support reactions - Calculate support displacement .-Calculate shear force and determine bending moment functions -Determine temperature effect	Determined by the instructor			Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing				
Health & Safety: Compliance with safety protection in the workplace				
Environmental Consideration: Compliance with environmental protection				

Title: Beams: Structural Dynamics	time			
	theoretical	practical	total	
	Determined by the instructor			

Knowledge ,skill ,attitude ,safety, Environmental Consideration	Equipments ,tools, materials ,books
Knowledge and Skill: - Perform dynamic analysis of beam - Identify Internal properties :Lumped mass - Identify Internal properties :Consistent mass - Identify free vibration: Natural frequencies and mode shapes - Identify Forced motion: modal superposition method	Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing	
Health & Safety: Compliance with safety protection in the workplace	
Environmental Consideration: Compliance with environmental protection	

Determined by the instructor

7

Title: Beams: Computer Applications	time			
	theoretical	practical	total	
	Determined by the instructor			
Knowledge ,skill ,attitude ,safety, Environmental Consideration				Equipments ,tools, materials ,books
Knowledge and Skill: - Identify the fundamentals of using program Sap2000 - Perform Structural analysis to determine displacements, reactions and plot displacement, shear forces and bending moment diagram - Perform structural dynamic analysis to determine natural frequencies, modal shapes, response to the concentrated force - Identify concepts of using time step of integration -perform time history function	Determined by the instructor			Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing				
Health & Safety: Compliance with safety protection in the workplace				
Environmental Consideration: Compliance with environmental protection				

8

Title: Analysis of Plane Frames	time			
	theoretical	practical	total	
	Determined by the instructor			

Knowledge ,skill ,attitude ,safety, Environmental Consideration		Equipments ,tools, materials ,books
Knowledge and Skill: -Determination of stiffness coefficient for axial forces -Determine element stiffness matrix for plane frame element -perform coordinate transformation -Identify inclined roller support -Analysis of plane frames using SAP2000 -Dynamic analysis of plane frames using SAP2000	Determined by the instructor	Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing		
Health & Safety: Compliance with safety protection in the workplace		
Environmental Consideration: Compliance with environmental protection		

Title: Analysis of Grid Frames	time			
	theoretical	practical	total	
	Determined by the instructor			

Knowledge ,skill ,attitude ,safety, Environmental Consideration				Equipments ,tools, materials ,books
Knowledge and Skill: -Determine element stiffness matrix for grid frame element -perform coordinate transformation -Identify lumped mass matrix for an element of a grid frame - Identify consistent mass matrix for an element of a grid frame -Analysis of plane frames using SAP2000 -Dynamic analysis of plane frames using SAP2000	Determined by the instructor			Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing				
Health & Safety: Compliance with safety protection in the workplace				
Environmental Consideration: Compliance with environmental protection				

Title: Analysis of Space Frames	time			
	theoretical	practical	total	
	Determined by the instructor			

Knowledge ,skill ,attitude ,safety, Environmental Consideration	Equipments ,tools, materials ,books
Knowledge and Skill: -Identify element stiffness matrix -Identify transformation of coordinate -Analysis of space frames using SAP2000 -Dynamic analysis of space frames using SAP2000 -Identify element mass matrix -Define element damping matrix -Obtain differential equation of motion	Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing	
Health & Safety: Compliance with safety protection in the workplace	
Environmental Consideration: Compliance with environmental protection	

Determined by the instructor

Title: Analysis of Plane Trusses	time			
	theoretical	practical	total	
	Determined by the instructor			

Knowledge ,skill ,attitude ,safety, Environmental Consideration	Equipments ,tools, materials ,books
Knowledge and Skill: -Assemble the system stiffness matrix -Determine end forces for an element of a truss -Analysis of Plane Trusses using SAP2000 -Dynamic analysis of Plane Trusses using SAP2000	Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing	
Health & Safety: Compliance with safety protection in the workplace	
Environmental Consideration: Compliance with environmental protection	

Determined by the instructor

12

Title: Analysis of Space Trusses	time			
	theoretical	practical	total	
	Determined by the instructor			

Knowledge ,skill ,attitude ,safety, Environmental Consideration	Equipments ,tools, materials ,books
Knowledge and Skill: -Obtained element stiffness matrix of space truss-local coordinates -Obtained element in global coordinates -Assemble the system stiffness matrix -Analysis of Space Trusses using SAP2000 -Dynamic analysis of Space Trusses using SAP2000	Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing	
Health & Safety: Compliance with safety protection in the workplace	
Environmental Consideration: Compliance with environmental protection	

The knowledge and skill section contains an embedded grid labeled "Determined by the instructor".

13

Title: Introduction to Finite Element Method	time			
	theoretical	practical	total	Equipments ,tools, materials ,books
	Determined by the instructor			
Knowledge ,skill ,attitude ,safety, Environmental Consideration				Equipments ,tools, materials ,books
Knowledge and Skill: -Implementing of FEM -Analysis of continuous structures -Determination of nodal stresses - Determination of system nodal displacement -Analysis of plate bending -Understanding of Finite element method: Structural dynamics	Determined by the instructor			Computers and Structures, Inc. (CSI)
Attitude: Speed and accuracy in doing the right thing				
Health & Safety: Compliance with safety protection in the workplace				
Environmental Consideration: Compliance with environmental protection				

Equipment & Tools & Materials & Resources (books, site, software…)form

  *Required quantity for each 16 Trainees