Form no. (12)
Course Specification

1- Course Data

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>Course Title:</th>
<th>Academic Year/Level:</th>
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<tbody>
<tr>
<td>CS 406</td>
<td>Virtual Environment</td>
<td>Fourth level (Second level)</td>
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<table>
<thead>
<tr>
<th>Specialization:</th>
<th>No. of Instructional Units:</th>
<th>Lecture</th>
<th>Lab</th>
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<tbody>
<tr>
<td>Computer Science</td>
<td></td>
<td>2</td>
<td>3</td>
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2- Course Aim

- This course is designed to encourage in students a sense of interest for Virtual reality concept and its application in different contexts
- Provide a solid foundation in the major areas of Virtual reality
- Provide education and training of high quality in Virtual Environment

3- Intended Learning Outcome

a- Knowledge and Understanding

- a1. Describe the main concepts, definitions of Virtual systems
- a2. Review theories and concepts used in Virtual Environment
- a3. Identify an understanding of the contribution and impacts of Virtual reality in scientific, social, economic, environmental, political and cultural terms.
- a4. Transformation and animations
- a5. Coloring and scaling
- a6. Key frames and motion objects
### b- Intellectual Skills
- b1. Manipulate and apply appropriate theories, principles and concepts relevant to Virtual reality
- b2. Critically assess and evaluate the literature within the field of Virtual Environment
- b3. Deduce and interpret information from a variety of sources relevant Virtual Environment

### c- Professional Skills
- c1. Plan, design and execute practical activities using techniques and procedures Appropriate to Virtual Environment
- c2. Execute a piece of independent research using Virtual Environment, computer media and techniques

### d- General Skills
- d1. Develop appropriate effective written and oral communication skills relevant to the specific course of Virtual Environment
- d2. Demonstrate the ability to work effectively as part of a group
- d3. Solve problems relevant to Virtual Environment using ideas and techniques some of which are at the forefront of the discipline.
- d4. Solve problems relevant to applications in real life in computer science using old and new languages some of which are at the forefront of the discipline;

### 4- Course Content
- Basic viewing and interrogation functions for visualization,
- Visualization of vector fields, Tensors and flow data,
- Visualization of scalar field or height field:Iso-surface by the marching cube method, Direct volume data rendering:
- Ray-casting, Transfer functions, Segmentation, Hardware, Stereoscopic display, Force feedback simulation, Haptic devices,
- Viewer tracking collision detection visibility computation, Time-critical rendering, Multiple levels of details (LOD),
- Image-base VR system, Distributed VR, Collaboration over computer network,
- Interactive modeling, User interface issues,
- Applications in medicine, Simulation and training,
- Color animation, Physical based animation, Animation of articulated structures: Forward and inverse kinematics, Scripting system,
- Key-frame animation, Inbetweening, Quaternions for orientation representation,
- Motion capture, Behavioral and procedural animation, Particle system, Metamorphosis,
- Free-form deformation.
<table>
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<tr>
<th>5- Teaching and Learning Methods</th>
<th>Lecturers – Home works - Oral discussion - Quizzes</th>
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<tbody>
<tr>
<td>6- Teaching and Learning Methods for Students with Special Needs</td>
<td>NONE</td>
</tr>
<tr>
<td>7- Student Assessment:</td>
<td></td>
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<tr>
<td>a- Procedures used:</td>
<td>Lecturers – tutorials- homework – oral discussion - Quizzes</td>
</tr>
</tbody>
</table>
| b- Schedule: | Mid-Term exam… …. Week 10  
Final exam …………… Week 17 |
| c- Weighing of Assessment: | Term work (exam + home works) 20%  
Lab exam 10%  
Oral exam 10%  
Final exam 60% |
<p>| 8- List of References: | Networked Virtual Environments: Design and Implementation |
| a- Course Notes | Course notes provided by the Faculty member of Computer Science Division, Math department, to be handled at the beginning of the semester. |</p>
<table>
<thead>
<tr>
<th><strong>b- Required Books (Textbooks)</strong></th>
<th>Creating Computer Simulation Systems: An Introduction to the High Level Architecture</th>
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<tr>
<td><strong>c- Recommended Books</strong></td>
<td>Flight Simulation: Virtual Environments In Aviation by Alfred T. Lee (2005)</td>
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<td><strong>d- Periodicals, Web Sites, ... etc.</strong></td>
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**Course Instructor:** Dr. Yasser Fouad  
**Head of Department:** Prof. Dr. Mahmoud El-Alem.  
**Date:** 1/7/2011