**Course Specifications**

**Programme(s) on which the course is given:** Physics & Laser
**Major or Minor element of programs** Physics
**Department offering the program** Physics
**Department offering the course** Physics
**Academic year / Level** second
**Date of specification approval** 2012

## A- Basic Information

| | | |
|---|---|---|
| **Title:** | **Design and construction of laser** | **Code: L231** |
| **Credit Hours:** | **3 h** | **Lecture: 3h** |
| **Tutorial: 00** | **Practicals: 00** | **Total: 3h** |

## B- Professional Information

### 1 – Overall Aims of Course

**The course will provide a general overview of some basic physical processes and engineering concepts used in the design of lasers. It will review and concentrate on the main types of lasers and their design, based on physical phenomena. The course will also include a brief overview of the most commonly used nonlinear materials, and methods of frequency shifting and conversion of laser output. Many practical examples relevant to the design and application of solid state, gas, liquid and semiconductor laser systems and laser materials will be included**

### 2 – Intended Learning Outcomes of Course (ILOs)

**a Knowledge and Understanding:**

**After completing the course the student will be able to**

**a1- Identify the general properties of laser light (mono. direct.)**

**a2 - Interpret active medium, population inversion and optical feed back.**

**a3 - give account on basic components such as resonators mirrors etc.**

**b-Intellectual Skills**

**After completing the course the student will be able to**

**b1 - interpret the knowledge about the new ideas in laser physics**

**b2 - prepare scientific reports about some points in laser physics**

**c Professional and Practical Skills**

**After completing the course the student will be able to**

**C1-apply the gained knowledge in how to build a laser system**

**c2 - reconstruct measure and optimize the laser output**

**d General and Transferable Skills**

**d1 - using computer and internet**

**d2 - team work and discussion**

**3- Contents**

| Topic | No. of hours | Lecture | Tutorial/Practical |
|---|---|---|---|
| PUMPING SYSTEMS | 6 | 2 | 0 |
| OPTICAL CAVITY | 6 | 2 | 0 |
| LASER MEDIA | 6 | 2 | 0 |
| TIME MODES OF OPERATION | 6 | 2 | 0 |
| CONTINUOUS WAVE SINGLE PULSED | 6 | 2 | 0 |
| SPECIFIC LASER TYPES | 6 | 2 | 0 |

| | | | |
|---|---|---|---|

**4– Teaching and Learning Methods**

**4.1- lecture**

**4.2- discussion**

**5- Student Assessment Methods**

**5.1 Oral to assess understanding**

**5.2-written exams to assess investigation, and derivations.**

**5.3 report to assess scientific review.**

**Assessment Schedule**

**Semester work exam in weeks 4, 6, 9**

**Med term exam in week 9**

**Final exam in week 16**

**Weighting of Assessments**

| | |
|---|---|
| **Mid-Term Examination** | **% 20** |
| **Final-term Examination** | **60 %** |
| **Oral Examination.** | **10 %** |
| **Semester Work** | **10 %** |
| **100** | **Total %** |

**6- List of References**


**6.1- "fundamentals of laser systems"**

**6.2- US Department of Energy (US DOE), Office of Industrial Technologies. Variable Speed Pumping – A Guide to Successful Applications. Executive Summary. 2004.**

**6.3- ^ G. P. Karman et al. "Laser optics: Fractal modes in unstable resonators" *Nature* 402, 138 (1999).**

**6.4- ^ D.Kouznetsov; J.F.Bisson, K.Takaichi, K.Ueda (2005). "Single-mode solid-state laser with short wide unstable cavity". *JOSAB* 22 (8): 1605–1619. Bibcode:2005JOSAB..22.1605K. doi:10.1364/JOSAB.22.001605.**

**6.5- Silfvast, William T. *Laser fundamentals*, Cambridge University Press, 2004. ISBN 0-521-83345-0**

## 7- Facilities Required for Teaching and Learning

**Data show – lab top computer - pens – blackboard - ...etc.**

**Course Coordinator: Dr. Hosam Ahmed Awad**
**Head of Department: Prof.Dr. Sana Maize**
**Date: / /**