

Rabi Ibrahim Raby

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Education

PhD in Electrical Engineering (Photonics) Jan. 2000- May 2003.

Wayne State University. Detroit-Michigan

Thesis Title "*Waveguide Gratings Mirror for Laser Resonators*".

Master in Electrical Engineering Jan. 1998 – Dec. 1998.

Wayne State University, Detroit-Michigan

Diploma in Electrical Engineering Sep. 1994-June 2006.

Jordan University of Science and Technology, Irbid-Jordan

Bachelor in Electrical Engineering Sep. 1989 – June 1994.

Jordan University of Science and Technology , Irbid-Jordan

Experience

Vice Dean of Nanotechnology Institute Sep. 2017-present

Jordan University of Science and Technology, Jordan

Professor March 2016- present.

Jordan University of Science and Technology, Jordan

Associate Professor April 2010- March 2016.

Jordan University of Science and Technology, Jordan

Assistant Professor Jan. 2005-2010

Jordan University of Science and Technology, Jordan

Teaching: Optoelectronics, Optic-fiber communication systems, Electronics, Circuits, Numerical methods, Photovoltaic solar cells, Instrumentations and measurements Linear algebra, Communication skills for engineers.

Research: Fabrication and characterization of Thin-film, optical planar waveguides, diffractive gratings; adaptive optics; diffractive optics; nonlinear optics and applications; Solar Conversion Technologies, PV multi-junction cells optimization, Thermo-photovoltaic systems, solar steam electrolysis optimization, effective solar concentrators design

Lecturer Jan. 2004-Jan. 2005

Yarmouk University, Hijawi Faculty for Applied Engineering, Jordan

Teaching: Optoelectronics, Optic-fiber communication systems, Intermediate Calculus, Electronics Lab., Logic design Lab.

Research & teaching assistant May 2000 – May 2003.

Wayne State University, Detroit-Michigan:

Research and develop optoelectronics devices and technologies. The research was supported by National Science Foundation (NSF) and in corporation with the Cornell Nanofabrication Facility at Cornell University, Ithaca/NY.

Electrical Design Engineer March 1999 – April 2000

TRW automotive, Farmington-Michigan: Work on airbag micro-controller electronic safety system, Detroit- Michigan.

Test Engineer Jan. 1999 – March 1999

Ford motor Company, Dearborn-Michigan: Work on developing test procedures for the functionality of vehicle systems and subsystems based on orthogonal arrays theory.

Communication Engineer (one year training) June 1996-June 1997

Working on telephone automatic switches troubleshooting.

Teaching assistant, Sep. 1994- June 1996 at JUST

Teaching and grading electrical engineering courses: circuit and electronics, electric machine lab, Control lab, Digital signal processing

Professional trainings

- Modern University instructional methods, JUST, Jordan, 2009.
- Testing And evaluation “ University examinations”, JUST, Jordan, 2005.
- Developing Optimal Test Procedures for the Vehicle Systems and Sub-systems Based on Orthogonal Arrays, Feb. 1999, Detroit Michigan.
- Electrical Design Techniques and Analysis required to meet Electromagnetic Compatibility Requirements (EMC), June 1999, Detroit-Michigan.
- Advanced EMC Printed Circuit Board Techniques, June 1999, Detroit-Michigan.
- Fundamentals of Systems Engineering, May 1999, Detroit-Michigan.
- Mastering Mathcad (Advanced), Nov. 1999, Detroit- Michigan.
- Valuing Diversity, Oct. 1999, Detroit- Michigan.

Skills

Clean room experience:

Photoresist coating, exposure, and developing; E-beam writing;

Dry etching; Annealing; Thin-film and optical planar waveguide fabrication

by rf magnetron sputtering; Thin-film characterization; atomic force microscopy AFM; optical spectrum analyzer; Lasers: semiconductor, dye, gas, solid state; Opto-mechanical setups.

Computer skills:

Matlab, Simulink, assembly programming, Mathcad, Lab view, Origin, Microsoft office.

Awards

- 1) Outstanding student recognition, JUST, Jordan , 1990.
- 2) Scientific outstanding student award, Yarmouk University, Jordan, 1989.

Academic supervising

a) Supervising master thesis:

1. Design of multilayer thin-film optical filters using particle swarm optimization method.
2. Photon management for effective production of solar hydrogen using hybrid thermo-photovoltaic water electrolysis, co-advisor from the mechanical engineering department (renewable energy master program) at JUST.
3. Optimized micro-controlled dc-to-dc convertor for maximum charging of storage batteries from photovoltaic cells, co-advisor from the electrical engineering department at JUST.
4. Matched lattice constant multi-junction solar cells with optimal thicknesses with maximum conversion efficiency, ongoing work with co-advisor from the mechanical engineering department (renewable energy master program) at JUST.

5. Theoretical optimized thermo-photovoltaic system design for maximum conversion efficiency, co-advisor from the mechanical engineering department (renewable energy master program) at JUST.

b) Supervising undergraduate graduation projects:

1. Optical barcode reader system.
2. Estimation of energy consumption in human walking by image processing techniques.
3. Temperature control of water outlets by microcontroller-controlled-mixer.
4. Windshield wiper speed controller using optical sensing.
5. Adaptive Iris opening controller by closed-feedback system.
6. Design and optimization of interference multilayer optical filters.
7. Sun tracker for maximum solar energy collection.
8. Active analog electric filters.
9. Optical Resonant Filters characterization.
10. Remote fire detection via mobile networks.
11. Anti-theft alarm system using motion infrared sensors.
12. Optical mark reader and grader.
13. Spatial illumination density distribution using microcontroller.
14. Micro processor controlled maximum charging of batteries from PV solar cells.
15. Electricity/ water consumption measurement using image recognition.

c) Supervising graduating students for the practical training program, JUST, Jordan, 2009

Committees

- 1) Electrical Engineering Department, communications committee.
- 2) Electrical Engineering Department, social relations committee (leader)
- 3) Graduates club (follow up with graduated students)
- 4) Graduation projects committees. (2004 –present)
- 5) Alumni day organizing committee (leader) 2014.
- 6) Electrical engineering laboratories' development committee (leader) 2015.

Referee

- 1) Optical Society of America: Applied Optics
- 2) Optical Society of America: Optics Letters
- 3) Optical Engineering
- 4) International Journal of Electrical Power and Energy Systems.
- 5) Progress in Electromagnetic Research
- 6) Journal of Electromagnetic Waves and Applications.
- 7) International Journal of Physical Sciences.

Industrial participations

- 1) Research and investigation of utilizing marble and stone processing wastes as useful material in construction works. The National FFF program Year 2007, company: Jordan Valley for Marble and Granite, Irbid-Jordan.
- 2) Design and develop a feedback closed loop PID controller for relative humidity control for a Silk weaving manufacturing. The National FFF program Year 2008, Company: General Textile Company, Irbid-Jordan.
- 3) Design and development of a computer based machine vision system for detection and rejection defected products in high rate production line. The National FFF program Year 2009, Company: Fine-Nuqul Industrial Group, Amman-Jordan.

- 4) Seminar for graduate program, JUST, Jordan, 2006. Title: Real-time high resolution optical thin-film deposition monitoring” seminar for graduate program.
- 5) Presentation in the scientific day, JUST, Jordan, 2005, Title: Reliable technologies for the fabrication of optical resonant filter.
- 6) Presentation for research accomplishments, Project # 975-011. Cornell Nano-fabrication Facility, Ithaca/NY Title: Compact High Brightness Semiconductor Lasers Using Waveguide Grating Mirror.

Grants

- 1) Compact High-Brightness Semiconductor Lasers Using Waveguide Grating Mirror, National Science Foundation, Award # ECS-0096800 (2001-2002)
- 2) Utilizing marble and stone processing wastes, Faculty For each Factory FFF program, 2007.
- 3) Silk manufacturing humidity regulator via feedback closed loop PID controller , FFF program, 2008
- 4) Computer based machine vision system for detection and rejection defected products in high rate production line, FFF program, 2009

Publications

Scientific Journals:

[1] R I Rabady, H Manasreh “Thicknesses optimization of two-and three-junction photovoltaic cells with matched currents and matched lattice constants” Solar Energy 158, 20-27, 2017

[2] RI Rabady “Optimal V-Reflector Design With Maximum Solar Concentration” Journal of Solar Energy Engineering 139 (3), 031010, 2017

[3] RI Rabady, B Kenaan “Power spectral shaping for hydrogen production from silicon based hybrid thermo-photovoltaic water electrolysis” Energy, 133, 1-8, 2017

[4] Rabi Rabady, “Optimized spectral splitting in thermo-photovoltaic system for maximum conversion efficiency” Energy, currently online, Nov.2016

- [5] R I Rabady and Ivan Avrutsky, "Light scattering in random planar structures supporting guiding modes" *Optik-International Journal for Light and Electron Optics* 127 (3), 1297-1300, 2016
- [6] R Rabady and A Andrawes, "Effective solar-thermal collector with uniform concentration"(2014) *Solar Energy* 105, 438–444, 2014.
- [7] R Rabady, "Specially profiled reflector for spherical front beams focusing", *Optik*, 125, 20, 6325-6328, 2014.
- [8] R Rabady, "Goos-Hänchen shift in the miniaturized total internal reflection lens" *Optical Engineering* 53(4), 2014
- [9] R Rabady, "Solar spectrum management for effective hydrogen production by hybrid thermo-photovoltaic water electrolysis" *International Journal of Hydrogen Energy* 39 (13) PP. 6872 – 6880, 2014
- [10] R Rabady and A Ababneh "Global optimal design of optical multilayer thin-film filters using particle swarm optimization" *Optik* 125 (1) PP. 548 – 553, 2014.
- [11] R Rabady, "Uniform sunlight concentration reflectors for photovoltaic cells" *Applied Optics* 53 (9) PP. 1862 – 1868, 2014.
- [12] R Rabady, "Optimized multi-junction photovoltaic solar cells for terrestrial applications" *Solar Energy*, 106, 72-81, 2014.
- [13] R Rabady "Simplified Model for Light Propagation in Graded-Index-Medium" *Optics and Photonics Journal*, 2 3 (07), 347, 2013.
- [14] R Rabady "Evolution of menstruation in mammals" *Scientific and Research Essays*, 8(22), pp. 960-964, 2013
- [15] R Rabady, "Modes of heat transfer in Leidenfrost effect", *Heat transfer research*, 41(2), 2010.
- [16] R Rabady, "Design of Semiconductor Laser Resonator Mirrors for Optimal Second-Harmonic Generation", *Opt. Eng.* Vol 48, No. 12, Sep. 2009.
- [17] R Rabady, "Design of optical resonant filter with multilayer waveguide", *Opt. Eng.*, Vol 48, No. 3, 2009.
- [18] R Rabady, "Theoretical design of multilayer planar waveguide for multiple harmonic generation with broadened phase-matching bandwidth by modal sandwiching, *J. Opt. A: Pure Appl. Opt.*, Vol 11, No. 6, 2009.
- [19] R Rabady, "Optimal Design of optical resonant filter", *Opt. Eng.*, Vol 48, No. 5, 2009.
- [20] R Rabady "Broadened phase-matching bandwidth in waveguide-frequency-doubling devices," *Appl. Opt.*, Vol. 48 Issue 33, pp.6417-6425, 2009.
- [21] R. Rabady and I. Avrutsky, "Titania, silica and tantalum pentoxide waveguides and optical resonant filters prepared by RF magnetron sputtering and annealing," *Appl. Opt.* 44(3), 378-383, 2005.
- [22] R. Rabady and I. Avrutsky, "Experimental characterization of optical resonant filters simultaneous spatial-spectral filtering," *Opt. Lett.*, Vol.22, No.6, 605-607, 2004.

- [23] R. Rabady and I. Avrutsky, "Fabrication methods of a close-to-rectangular shape optical resonant filter," *Appl. Opt.*, Vol. 43, No.5, 1114-1120 , 2004.
- [24] R. Rabady, K. Zinoviev, and I. Avrutsky, "High-resolution photometric optical monitoring for thin films deposition," *Appl. Opt.* Vol.43, No.1, 143-148 (Jan. 2004).
- [25] R. Rabady and I. Avrutsky, "Reduced surface roughness of solid thin films prepared by alternating biased RF magnetron sputtering," *JOSA-B*, Vol.22, No.11, 2174-2178, 2003.
- [26] R. Rabady, D. Frankstein, and I. Avrutsky, "Heat treatment for reduction of surface roughness on holographic gratings," *Opt. Lett.*, Vol.28, No.18, 1665-1667, 2003.
- [27] R. Rabady and I. Avrutsky, "Reliable fabrication technologies for optical resonant filters," *Appl. Opt.*, Vol. 42, No.22, 4499-4504, 2003.
- [28] I. Avrutsky, R. Rabady, and K. Zinoviev, "Spectral and spatial filtering using waveguide grating mirror," *Trends in Optics and Photonics (TOPS)*, 75, 285-289, 2002.
- [29] I. Avrutsky and R. Rabady, "Waveguide grating mirror for large-area semiconductor lasers," *Opt. Lett.*, Vol.26, No.13,989-991,2001.

Conferences and Scientific Meetings:

- [1] I. Avrutsky, R. Rabady, and K. Zinoviev, "Spectral and spatial filtering using waveguide grating mirror," presented at Diffractive Optics and Micro-Optics meeting, DOMO-2002, Tucson, Arizona, 3-6 June/2002, paper DWB1.
- [2] I. Avrutsky, K. Zinoviev, and R. Rabady, "Compact High Brightness Semiconductor Lasers Using Waveguide Grating Mirror," 2001/2002 CNF research accomplishments, Project # 975-01, Cornell Nano-fabrication Facility, Ithaca/NY.
- [3] I. Avrutsky and R. Rabady, " Mode selection in large semiconductor lasers using waveguide grating mirror," OSA-2001/ ILS-XVII, Paper TUR6, Long Beach, CA (Oct. 2001).