



# INSTITUTO POLITÉCNICO NACIONAL

## SECRETARÍA DE INVESTIGACIÓN Y POSGRADO

### 1 DIRECCIÓN DE POSGRADO

#### 1.1 FORMATO GUÍA PARA REGISTRO DE ASIGNATURAS

Hoja 1 de 4

#### I. DATOS DEL PROGRAMA Y LA ASIGNATURA

1.1 NOMBRE DEL PROGRAMA: Maestría en Ciencias en Ingeniería de Cómputo

1.2 COORDINADOR DEL PROGRAMA: Dr. José Luis Oropeza Rodríguez

1.3 NOMBRE DE LA ASIGNATURA: Internet de las cosas / Internet of Things

1.4 CLAVE: \_\_\_\_\_ (Para ser llenado por la SIP)

1.5 TIPO DE ASIGNATURA:

OBLIGATORIA	<input type="checkbox"/>	OPTATIVA	<input checked="" type="checkbox"/>
SEMINARIO	<input type="checkbox"/>	ESTANCIA	<input type="checkbox"/>

1.6 NÚMERO DE HORAS:

TEORÍA	<input type="checkbox"/>	80	PRACTICA	<input type="checkbox"/>	T-P	<input type="checkbox"/>
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1.7 UNIDADES DE CRÉDITO:  8

1.8 FECHA DE LA ELABORACIÓN DEL PROGRAMA DE LA ASIGNATURA:

13	12	2013
d	m	a

1.9 SESIÓN DEL COLEGIO DE PROFESORES EN QUE SE ACORDÓ LA IMPLANTACIÓN DE LA ASIGNATURA:

SESIÓN No.	3 Extr	FECHA:	13	11	2013
			d	m	a

1.10 FECHA DE REGISTRO EN SIP:    (Para ser llenado por la SIP)

d	M	a
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#### II. DATOS DEL PERSONAL ACADÉMICO

2.1 COORD. ASIGNATURA: Dr. Ponciano Jorge Escamilla Ambrosio CLAVE: 10095-EA-14

2.2 PROF. PARTICIPANTE: Dr. Moisés Salinas Rosales CLAVE: 8657-EC-12

### III. DESCRIPCIÓN DEL CONTENIDO DEL PROGRAMA DE LA ASIGNATURA

#### III.1 OBJETIVO GENERAL:

At the end of the course the student will have a comprehensive understanding of the most important topics about the emerging field of "Embedded Internet", "Internet of Things (IoT)", and "Future Internet".

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#### III.2 DESCRIPCIÓN DEL CONTENIDO

TEMAS Y SUBTEMAS	TIEMPO
1. Introduction to the Internet of things 1.1. Definition 1.2. Enabling technologies 1.3. Applications 1.4. Challenges and opportunities 1.5. Potential social impact	4 hrs
2. Platforms and technology 2.1. Architecture of an IoT device 2.2. Hardware components 2.3. Energy requirements 2.4. Platforms 2.5. Operating systems	8 hrs
3. Physical layer 3.1. Overview of wireless communications 3.2. Wireless channel 3.3. Channel models	8 hrs
4. MAC protocols 4.1. Challenges for MAC protocols 4.2. Contention based protocols 4.3. Reservation based protocols 4.4. Hybrid protocols	8 hrs
5. Network layer 5.1. Motivation and challenges for routing 5.2. Link and routing metrics 5.3. Probability routing 5.4. Content based routing/ Data centric routing 5.5. Graphical routing 5.6 RPL	10 hrs

6. 6LoWPAN 6.1. Introduction to 6LoWPAN 6.2. The Internet architecture and protocols 6.3. Link layer technologies 6.4. The 6LoWPAN format 6.5. Bootstrapping	10 hrs
7. Transport layer 7.1. Introduction 7.2. TCP 7.3. RMTS 7.4. PSFQ 7.5. ESRT 7.6. STCP	10 hrs
8. Application Layer 8.1. Introduction 8.2. CoAP 8.3. Query processing	8 hrs
9. Security 9.1. Privacy 9.2. Security 9.3. Trust	8 hrs
10. Testbeds and Experimentation 10.1. Testbed architectures 10.2. Historical review of testbeds 10.3. The testbed in the box problem 10.4. Experiment lifecycle 10.5. The DES approach 10.6. Analysis of experiments	6 hrs

### III.3 BIBLIOGRAFIA UTILIZADA EN LA ASIGNATURA

#### Books

1. Hersent, O., Boswarthick, D. and Elloumi, O., The Internet of things: Key applications and protocols, 2<sup>nd</sup> Edition, Wiley, UK, 2012.
2. Delicato, F.C., Pires, P.F. and Batista, T., Middleware solutions for the Internet of things, Springer, Switzerland, 2013.
3. GAglio, S. and Re, G.L., Advances onto the Internet of things: How ontologies make the Internet of things meaningful, Springer, Switzerland, 2014.
4. Bessis, N. and Dobre, C., Big data and Internet of things: A roadmap for smart environments, Springer, Switzerland, 2014.
5. daCosta, F., Rethinking the Internet of things: A scalable approach to connecting everything, Apress Open, USA, 2013.
6. Uckelmann, D., Harrison, M. and Michahelles, F., Architecting the Internet of things, Springer-Verlag, Berlin Heidelberg, 2011.
7. Vermesan, P. and Friess, P., Internet of things – Converging technologies for smart environments and integrated ecosystems, River Publishers, Denmark, 2013.
8. Mukhopadhyay, S.C., Internet of things: Challenges and opportunities, Springer, Switzerland, 2014.
9. Shelby, Z. and Bormann, C., 6LoWPAN: The wireless embedded Internet, Wiley, UK, 2009.

#### Links to additional reading lists:

1. <http://iot.ieee.org/>

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2. <http://www.internet-of-things-research.eu/>

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3. [http://antlab.elet.polimi.it/index.php?option=com\\_content&view=article&id=254&Itemid=259](http://antlab.elet.polimi.it/index.php?option=com_content&view=article&id=254&Itemid=259)

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4. <http://www.cdait.gatech.edu/>

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### **III.4 PROCEDIMIENTOS O INSTRUMENTOS DE EVALUACIÓN A UTILIZAR**

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Performance on the course will be assessed with the following criteria:

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Midterm Exam 30%

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Final Exam 20%

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Homework 20%

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Final Project 30%

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