

[GAJJ03] THERMO-FLUID POWER GENERATION CYCLES

GENERAL INFORMATION

| | | | |
|------------------|------------------------------|--|--|
| Studies | DEGREE IN ENERGY ENGINEERING | Subject | THERMAL AND FLUID ENGINEERING |
| Semester | 1 | Course | 3 |
| Character | COMPULSORY | Mention / Field of specialisation | |
| Plan | 2013 | Language | ENGLISH |
| Credits | 6 | Hours/week | 3.33 |
| | | Total hours | 60 class hours + 90 non-class hours = 150 total hours |

FACULTY

ZARATE LARRINAGA, ENRIQUE

REQUIRED PREVIOUS KNOWLEDGE

| Subjects | Knowledge |
|-----------------|-----------|
| FLUID MECHANICS | English |
| THERMAL ENERGY | |

SKILLS

| SKILLS | ECTS |
|---|----------|
| G1A311 - To have applied knowledge of thermal engineering. | 5,52 |
| G1A313 - To be able to work in multidisciplinary, multilingual environments, and to effectively communicate knowledge, procedures, results and ideas about energy both verbally and in writing. | 0,48 |
| Total: | 6 |

LEARNING RESULTS

RG332 [!] *Analiza los ciclos termodinámicos utilizados para producción de energía y refrigeración utilizando diferentes aproximaciones y herramientas.*

LEARNING ACTIVITIES

| | CH | NCH | TH |
|--|-------|-------|-------|
| Classroom presentations of relevant concepts and procedures in participatory environments. | 30 h. | | 30 h. |
| Individual and group exercises. | 20 h. | 10 h. | 30 h. |
| Individual study and work, tests and evaluations. | | 12 h. | 12 h. |

EVALUATION SYSTEM

| | W |
|--|-----|
| Individual written and oral tests to assess technical skills in the subject. | 75% |
| undefined | 25% |
| Comments: | |

MAKE-UP MECHANISMS

Individual written and oral tests to assess technical skills in the subject.
Comments:

CH - Class hours: 50 h.
NCH - Non-class hours: 22 h.
TH - Total hours: 72 h.

RG333 [!] *Dimensiona y selecciona los componentes de equipos de generación e intercambio térmico.*

LEARNING ACTIVITIES

| | CH | NCH | TH |
|--|------|------|------|
| Classroom presentations of relevant concepts and procedures in participatory environments. | 8 h. | | 8 h. |
| Individual and group exercises. | 2 h. | 4 h. | 6 h. |
| Individual study and work, tests and evaluations. | | 4 h. | 4 h. |

EVALUATION SYSTEM

| | W |
|--|-----|
| Individual written and oral tests to assess technical skills in the subject. | 75% |
| undefined | 25% |
| Comments: | |

MAKE-UP MECHANISMS

Individual written and oral tests to assess technical skills in the subject.
Comments:

CH - Class hours: 10 h.
NCH - Non-class hours: 8 h.
TH - Total hours: 18 h.

RG334 [!] *Aplica conocimientos de ingeniería térmica en un entorno real o simulado*

LEARNING ACTIVITIES

CH

NCH

TH

Development, writing and presentation of group projects and/or POPBL.

48 h.

48 h.

EVALUATION SYSTEM

W

Project assessment. The following will be taken into account: 100%
(a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution.

Comments:

CH - Class hours: 0 h.

NCH - Non-class hours: 48 h.

TH - Total hours: 48 h.

MAKE-UP MECHANISMS

[!] *Evaluación continua*

Comments:

RG337 [!] *Define los objetivos, realiza la planificación para su consecución y su seguimiento sistemático coordinando su trabajo con los demás miembros del equipo.*

LEARNING ACTIVITIES

CH

NCH

TH

Development, writing and presentation of group projects and/or POPBL.

3 h.

3 h.

EVALUATION SYSTEM

W

Project assessment. The following will be taken into account: 100%
(a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution.

Comments:

CH - Class hours: 0 h.

NCH - Non-class hours: 3 h.

TH - Total hours: 3 h.

MAKE-UP MECHANISMS

[!] *Evaluación continua*

Comments:

RG338 [!] *Argumenta la selección de las teorías, métodos y/o tecnologías más relevantes que permitan definir y/o solucionar un problema utilizando bibliografía de calidad*

LEARNING ACTIVITIES

CH

NCH

TH

Development, writing and presentation of group projects and/or POPBL.

3 h.

3 h.

EVALUATION SYSTEM

W

Project assessment. The following will be taken into account: 100%
(a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution.

Comments:

CH - Class hours: 0 h.

NCH - Non-class hours: 3 h.

TH - Total hours: 3 h.

MAKE-UP MECHANISMS

[!] *Evaluación continua*

Comments:

RG339 [!] Redacta informes técnicos de forma clara, concisa y estructurada siguiendo las especificaciones establecidas haciendo énfasis en la coherencias entre los distintos apartados .

LEARNING ACTIVITIES

CH

NCH

TH

Development, writing and presentation of group projects and/or POPBL.

3 h.

3 h.

EVALUATION SYSTEM

W

MAKE-UP MECHANISMS

Project assessment. The following will be taken into account: 100%

(a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution.

Comments:

[!] Evaluación continua

Comments:

CH - Class hours: 0 h.

NCH - Non-class hours: 3 h.

TH - Total hours: 3 h.

RG340 [!] Presenta y defiende el trabajo en público de forma clara, concisa y estructurada mediante el uso apropiado de soporte visual según las especificaciones establecidas.

LEARNING ACTIVITIES

CH

NCH

TH

Development, writing and presentation of group projects and/or POPBL.

3 h.

3 h.

EVALUATION SYSTEM

W

MAKE-UP MECHANISMS

Project assessment. The following will be taken into account: 100%

(a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution.

Comments:

[!] Evaluación continua

Comments:

CH - Class hours: 0 h.

NCH - Non-class hours: 3 h.

TH - Total hours: 3 h.

CONTENTS

1. Exergy

–Work potential of energy. Exergy.

–Exergy balance in closed and open systems.

2. Gas Power Cycles

–Joule-Brayton Cycle. Intercooling, reheating and regeneration.

–Jet-propulsion cycle.

3. Vapor Power Cycles

–The Carnot Vapor Cycle.

–Rankine Cycle. Reheating and regeneration.

–Cogeneration.

-Combined cycles.

4. Refrigeration Cycles

–Reversed Carnot Cycle.

–The Vapor-Compression Refrigeration Cycle.

5. Humid air

–Specific and relative humidity. Thermal properties of humid air.

–Air conditioning.

–Wet cooling towers.

6. Heat exchangers

–The LMTD and NTU methods.

–Selection of Heat Exchangers.

7. Combustion and steam generators

–Fuels and combustion reactions.

–Combustion chambers and boilers.

LEARNING RESOURCES AND BIBLIOGRAPHY

| Learning resources | Bibliography |
|--------------------------|--|
| Moodle Platform | Y. A. Çengel, M. A. Boles “Thermodynamics. An Engineering Approach”, Mc Graw Hill, 8th edition (2015). |
| Slides of the subject | P. K. Nag, “Power Plant Engineering”, Mc Graw Hill, 4th edition (2015). |
| Subject notes | Y. A. Çengel, A. J. Ghajar “Heat and Mass Transfer”, Mc Graw Hill, 5th edition (2015). |
| Specific Master Software | (Ebook) M. Massoud, “Engineering Thermofluids”, Springer (2005). |
| | (Ebook) H. Struchtrup, “Thermodynamics and Energy Conversion”, Springer (2014). |
| | R. Collins, “Power Plant Primer”, U. Oregon (2014). |
| | E. Woodruff, H. Lammers, T. Lammers, “Steam Plant Operation”, Mc Graw Hill 9th edition (2011). |
| | M. P. Boyce, “Gas Turbine Engineering handbook”, Butterworth-Heinemann, 4th edition (2011). |
| | Black&Veatch, “Power Plant Eginieering”, Springer (1996). |
| | T. Elliot, K. Chen, R. Swanekamp, “Standard Handbook of Powerplant Engineering”, Mc Graw Hill 2nd edition (1997). |
| | T. L. Bergman, A. S. Lavine, F. P. Incropera, D. P. Dewitt, “Fundamentals of Heat and Mass Transfer”, Wiley, 7th edition (2011). |