

## Zero Defect Manufacturing for Circular Economy Programme

- Study plan -

UCD – Grenoble collaboration

### *General structure of the EIT-M Master Programme*

| Type of modules                             | Total credits for EIT-M Master | Total credits 1 <sup>st</sup> year | Total credits 2 <sup>nd</sup> year |
|---|--------------------------------|------------------------------------|------------------------------------|
| Technical courses (TC)                      | 45                             | 40-50                              | 10-20                              |
| Specialization courses (SC)                 | 15                             |                                    |                                    |
| Innovation & entrepreneurship courses (I&E) | 30                             | 10-20                              | 10-20                              |
| Master thesis (MT)                          | 30                             | 0                                  | 30                                 |
| Tot   | 120                            | 60                                 | 60                                 |

### *Entry university UCD – exit university Grenoble INP*

#### **1<sup>st</sup> year - UCD**

| Type of modules | UCD courses  | ECTS | Semester | Total credits |
|-----------------|--|------|----------|---------------|
| TC              | <a href="#">Systems Analysis &amp; Improvement (Core)</a>                      | 5    | 1        |               |
|                 | <a href="#">Manufacturing Engineering II (core)</a>                            | 5    | 1        |               |
|                 | <a href="#">Engineering Project Management - Tools &amp; Techniques (core)</a> | 5    | 1        |               |
|                 | <a href="#">Eng. Decision Support Systems (core)</a>                           | 5    | 2        |               |
|                 | <a href="#">Operations Management (core)</a>                                   | 5    | 2        |               |
|                 | <a href="#">Advanced Polymer Engineering (core)</a>                            | 5    | 2        |               |
| SC              | <a href="#">Supply Chain Design &amp; Analysis (core)</a>                      | 5    | 1        |               |
|                 | <a href="#">Mechanical Engineering Design I (core)</a>                         | 5    | 2        |               |
| I&E             | <a href="#">Mechanical Engineering Design II (core)</a>                        | 5    | 1        |               |
|                 | <a href="#">Technical Communication (core)</a>                                 | 5    | 1        |               |
|                 | <a href="#">Professional Eng. (Finance) (core)</a>                             | 5    | 2        |               |
|                 | <a href="#">Professional Engineering (Management) (core)</a>                   | 5    | 2        |               |

## 2<sup>nd</sup> year - Grenoble INP

| Type of modules               | Grenoble courses                                    | ECTS | Semester | Total credits |
|-------------------------------|---|------|----------|---------------|
| TC (mandatory)                | AI for production systems                           | 5    | S3       | 15            |
|                               | Smart analytics for big data                        | 5    | S3       |               |
|                               | Digital chain for industry 4.0, including VR and AR | 5    | S3       |               |
| SC (1 choice out of 2)        | Sustainable manufacturing                           | 6    | S3       | 6             |
|                               | Advanced LCA for production systems                 | 6    | S3       |               |
| I&E (the first two mandatory) | Centrally organized summer school                   | 5    |          | 10            |
|                               | Operational excellence in R&D                       | 5    | S3       |               |
|                               | Innovation challenge                                | 0    | S3       |               |
| MT                            | Master thesis (core)                                | 30   | S4       | 30            |

## Recap

| Type of modules | ECTS in S1 | ECTS in S2 | ECTS in S3 | ECTS in S4 | Total credits |
|-----------------|------------|------------|------------|------------|---------------|
| TC              | 15         | 15         | 15         |            | <b>45</b>     |
| SC              | 5          | 5          | 6          |            | <b>16</b>     |
| I&E             | 10         | 10         | 10         |            | <b>30</b>     |
| MT              |            |            |            | 30         | <b>30</b>     |
| <b>Total</b>    | <b>30</b>  | <b>30</b>  | <b>31</b>  | <b>30</b>  | <b>121</b>    |

## Zero Defect Manufacturing for Circular Economy Programme

- Study plan -

Grenoble - Aalto collaboration

### General structure of the EIT-M Master Programme

| Type of modules                             | Total credits for EIT-M Master | Total credits 1 <sup>st</sup> year | Total credits 2 <sup>nd</sup> year |
|---|--------------------------------|------------------------------------|------------------------------------|
| Technical courses (TC)                      | 45                             | 40-50                              | 10-20                              |
| Specialization courses (SC)                 | 15                             |                                    |                                    |
| Innovation & entrepreneurship courses (I&E) | 30                             | 10-20                              | 10-20                              |
| Master thesis (MT)                          | 30                             | 0                                  | 30                                 |
| Tot   | 120                            | 60                                 | 60                                 |

### Entry university Grenoble – exit university Aalto

#### 1<sup>st</sup> year - Grenoble INP

| Type of modules | UCD courses  | ECTS | Semester | Total credits |
|-----------------|--|------|----------|---------------|
| TC              | Sustainability in industrial engineering and economics             | S1   | 6        |               |
|                 | Information systems management, including project                  | S1   | 6        |               |
|                 | Performance evaluation of production systems                       | S1   | 3        |               |
|                 | Sustainable design, management and economics                       | S2   | 6        |               |
|                 | Discrete event simulation  | S2   | 6        |               |
|                 | Data analytics for industrial engineering                          | S2   | 3        |               |
| SC              | Quality and process development                                    | S1   | 3        |               |
|                 | Production and operations management, including project            | S2   | 6        |               |
| I&E             | Sociology, environment and innovation, including challenge         | S1   | 6        |               |
|                 | Intercultural communication and collaborative engineering design 1 | S1   | 6        |               |
|                 | Collaborative engineering design project 2                         | S2   | 6        |               |
|                 | Innovative problem solving and bio-inspired innovation             | S2   | 3        |               |

**2<sup>nd</sup> year Aalto**

- Language course (mandatory degree requirement at Aalto, e.g. LC-1310 Academic Communication for Msc students) on top of the 60 ECTS
- Summer school included in 2nd year I&E module

| Type of modules | Aalto courses   | ECTS | Semester | Total credits |
|-----------------|---|------|----------|---------------|
| TC              | <a href="#">MEC-E7007 Factory Project (mandatory)</a>                     | 5    | 1        | 5             |
|                 | <i>Select 1 of the following:</i>   |      | 1        | 5             |
|                 | <a href="#">ELEC-E8102 Distributed and Intelligent Automation Systems</a> | 5    | 1        |               |
|                 | <a href="#">ELEC-E8714 Sustainable Electronics</a>                        | 5    | 1        |               |
|                 | <a href="#">MEC-E1001 Mechanical Engineering in Society</a>               | 5    | 1        |               |
|                 | <a href="#">ELEC-E8103 Modelling, Estimation and Dynamic Systems</a>      | 5    | 1        |               |
| SC              | <a href="#">MEC-E1090 Quality Management and Metrology</a> (mandatory)    | 5    | 1        | 5             |
| Other           | <a href="#">LC-XXXX Compulsory language course</a>                        | 3    | 1        | 3             |
| I&E             | Centrally organized summer school   | 5    | 1*       | 5             |
|                 | <a href="#">TU-E4100 Startup Experience</a>                               | 9    | 1        | 9             |
|                 | <a href="#">TU-C2080 Entrepreneurship Essentials</a>                      | 1    | 1        | 3             |
| MT              | Master thesis   | 30   | 2        | 63            |

*Recap*

| Type of modules | ECTS in S1 | ECTS in S2 | ECTS in S3 | ECTS in S4 | Total credits |
|-----------------|------------|------------|------------|------------|---------------|
| TC              | 15         | 15         | 10         |            | 40            |
| SC              | 3          | 6          | 5          |            | 14            |
| I&E             | 12         | 9          | 15         |            | 36            |
| MT              |            |            |            | 30         | 30            |
| Language        |            |            | 3          |            |               |
| Total           | 30         | 30         | 33         | 30         | 123           |

## Zero Defect Manufacturing for Circular Economy Programme

- Study plan -

Polimi - Grenoble collaboration

### *General structure of the EIT-M Master Programme*

| Type of modules                             | Total credits for EIT-M Master | Total credits 1 <sup>st</sup> year | Total credits 2 <sup>nd</sup> year |
|---|--------------------------------|------------------------------------|------------------------------------|
| Technical courses (TC)                      | 45                             | 40-50                              | 10-20                              |
| Specialization courses (SC)                 | 15                             |                                    |                                    |
| Innovation & entrepreneurship courses (I&E) | 30                             | 10-20                              | 10-20                              |
| Master thesis (MT)                          | 30                             | 0                                  | 30                                 |
| Tot   | 120                            | 60                                 | 60                                 |

### *Entry university Polimi – exit university Grenoble INP*

#### 1<sup>st</sup> year - Polimi

| Type of modules | POLIMI courses   | ECTS | Semester | Total credits             |
|-----------------|--|------|----------|---------------------------|
| TC              | <a href="#">Advanced manufacturing processes</a>                     | 10   | 1        | 37<br>(25 sem 1, 12 sem2) |
|                 | <a href="#">Applied metallurgy</a>                                   | 6    | 1        |                           |
|                 | <a href="#">Control and actuating devices for mechanical systems</a> | 9    | 1        |                           |
|                 | <a href="#">Measurements</a>   | 5    | 2        |                           |
|                 | <a href="#">Machine design</a>                                       | 7    | 2        |                           |
| SC              | <a href="#">Quality data analysis</a>                                | 8    | 1        | 8 (8 sem1)                |
| I&E             | <a href="#">Design &amp; management of production systems</a>        | 10   | 2        | 15 (15 sem 2)             |
|                 | <a href="#">Managing technology disruption</a>                       | 5    | 2        |                           |

## 2<sup>nd</sup> year - Grenoble INP

| Type of modules            | Grenoble INP courses                                | ECTS | Semester | Total credits |
|----------------------------|---|------|----------|---------------|
| TC<br>(2 choices out of 3) | AI for production systems                           | 5    | 3        | 10            |
|                            | Smart analytics for big data                        | 5    | 3        |               |
|                            | Digital chain for industry 4.0, including VR and AR | 5    | 3        |               |
| SC<br>(1 choice out of 2)  | Sustainable manufacturing                           | 6    | 3        | 6             |
|                            | Advanced LCA for production systems                 | 6    | 3        |               |
| I&E<br>(all 3 mandatory)   | Centrally organized summer school                   | 5    | TBC      | 14            |
|                            | Operational excellence in R&D                       | 5    | 3        |               |
|                            | Innovation challenge                                | 4    | 3        |               |
| MT                         | Master thesis                                       | 30   | 4        | 30            |

## Recap

| Type of modules | ECTS in S1 | ECTS in S2 | ECTS in S3 | ECTS in S4 | Total credits |
|-----------------|------------|------------|------------|------------|---------------|
| TC              | 25         | 12         | 10         | 0          | <b>45</b>     |
| SC              | 8          | 5          | 6          | 0          | <b>15</b>     |
| I&E             | 0          | 15         | 14         | 0          | <b>30</b>     |
| MT              | 0          | 0          | 0          | 30         | <b>30</b>     |
| Tot             | <b>33</b>  | <b>27</b>  | <b>30</b>  | <b>30</b>  | <b>120</b>    |

## Zero Defect Manufacturing for Circular Economy Programme

- Study plan -

Polimi - Aalto collaboration

### *General structure of the EIT-M Master Programme*

| Type of modules                             | Total credits for EIT-M Master | Total credits 1 <sup>st</sup> year | Total credits 2 <sup>nd</sup> year |
|---|--------------------------------|------------------------------------|------------------------------------|
| Technical courses (TC)                      | 45                             | 40-50                              | 10-20                              |
| Specialization courses (SC)                 | 15                             |                                    |                                    |
| Innovation & entrepreneurship courses (I&E) | 30                             | 10-20                              | 10-20                              |
| Master thesis (MT)                          | 30                             | 0                                  | 30                                 |
| Tot   | 120                            | 60                                 | 60                                 |

### *Entry university Polimi – exit university Aalto*

#### **1<sup>st</sup> year - Polimi**

| Type of modules | POLIMI courses   | ECTS | Semester | Total credits             |
|-----------------|--|------|----------|---------------------------|
| TC              | <a href="#">Advanced manufacturing processes</a>                     | 10   | 1        | 37<br>(25 sem 1, 12 sem2) |
|                 | <a href="#">Applied metallurgy</a>                                   | 6    | 1        |                           |
|                 | <a href="#">Control and actuating devices for mechanical systems</a> | 9    | 1        |                           |
|                 | <a href="#">Measurements</a>   | 5    | 2        |                           |
|                 | <a href="#">Machine design</a>                                       | 7    | 2        |                           |
| SC              | <a href="#">Quality data analysis</a>                                | 8    | 1        | 8 (8 sem1)                |
| I&E             | <a href="#">Design &amp; management of production systems</a>        | 10   | 2        | 15 (15 sem 2)             |
|                 | <a href="#">Managing technology disruption</a>                       | 5    | 2        |                           |

## 2<sup>nd</sup> year Aalto

| Type of modules | Aalto courses   | ECTS | Semester | Total credits |
|-----------------|---|------|----------|---------------|
| TC              | <a href="#">MEC-E7007 Factory Project (mandatory)</a>                     | 5    | 1        | 5             |
|                 | <i>Select 1 of the following:</i>   |      | 1        | 5             |
|                 | <a href="#">ELEC-E8102 Distributed and Intelligent Automation Systems</a> | 5    | 1        |               |
|                 | <a href="#">ELEC-E8714 Sustainable Electronics</a>                        | 5    | 1        |               |
|                 | <a href="#">MEC-E1001 Mechanical Engineering in Society</a>               | 5    | 1        |               |
|                 | <a href="#">ELEC-E8103 Modelling, Estimation and Dynamic Systems</a>      | 5    | 1        |               |
| SC              | <a href="#">MEC-E1090 Quality Management and Metrology (mandatory)</a>    | 5    | 1        | 5             |
| Other           | <a href="#">LC-XXXX Compulsory language course</a>                        | 3    | 1        | 3             |
| I&E             | Centrally organized summer school   | 5    | 1*       | 5             |
|                 | <a href="#">TU-E4100 Startup Experience</a>                               | 9    | 1        | 9             |
|                 | <a href="#">TU-C2080 Entrepreneurship Essentials</a>                      | 1    | 1        | 1             |
| MT              | Master thesis   | 30   | 2        | 63            |

## Recap

| Type of modules | ECTS in S1 | ECTS in S2 | ECTS in S3 | ECTS in S4 | Total credits |
|-----------------|------------|------------|------------|------------|---------------|
| TC              | 25         | 12         | 10         |            | 47            |
| SC              | 8          | 0          | 5          |            | 13            |
| I&E             | 0          | 15         | 15         |            | 30            |
| MT              | 0          | 0          |            | 30         | 30            |
| Language        |            |            | 3          |            | 3             |
| <b>Tot</b>      | <b>33</b>  | <b>27</b>  | <b>33</b>  | <b>30</b>  | <b>123</b>    |



## Zero Defect Manufacturing for Circular Economy Programme

- Study plan -

UCD - Aalto collaboration

### General structure of the EIT-M Master Programme

| Type of modules                             | Total credits for EIT-M Master | Total credits 1 <sup>st</sup> year | Total credits 2 <sup>nd</sup> year |
|---|--------------------------------|------------------------------------|------------------------------------|
| Technical courses (TC)                      | 45                             | 40-50                              | 10-20                              |
| Specialization courses (SC)                 | 15                             |                                    |                                    |
| Innovation & entrepreneurship courses (I&E) | 30                             | 10-20                              | 10-20                              |
| Master thesis (MT)                          | 30                             | 0                                  | 30                                 |
| Tot   | 120                            | 60                                 | 60                                 |

### Entry university UCD – exit university Aalto

#### 1<sup>st</sup> year - UCD

| Type of modules | UCD courses  | ECTS | Semester | Total credits |
|-----------------|--|------|----------|---------------|
| TC              | <a href="#">Systems Analysis &amp; Improvement (Core)</a>                      | 5    | 1        |               |
|                 | <a href="#">Manufacturing Engineering II (core)</a>                            | 5    | 1        |               |
|                 | <a href="#">Engineering Project Management - Tools &amp; Techniques (core)</a> | 5    | 1        |               |
|                 | <a href="#">Eng. Decision Support Systems (core)</a>                           | 5    | 2        |               |
|                 | <a href="#">Operations Management (core)</a>                                   | 5    | 2        |               |
|                 | <a href="#">Advanced Polymer Engineering (core)</a>                            | 5    | 2        |               |
|                 | <a href="#">Mechanical Engineering Design II (core)</a>                        | 5    | 1        |               |
| SC              | <a href="#">Supply Chain Design &amp; Analysis (core)</a>                      | 5    | 1        |               |
|                 | <a href="#">Mechanical Engineering Design I (core)</a>                         | 5    | 2        |               |
| I&E             | <a href="#">Technical Communication (core)</a>                                 | 5    | 1        |               |
|                 | <a href="#">Professional Eng. (Finance) (core)</a>                             | 5    | 2        |               |
|                 | <a href="#">Professional Engineering (Management) (core)</a>                   | 5    | 2        |               |

## 2<sup>nd</sup> year Aalto

| Type of modules | Aalto courses   | ECTS | Semester | Total credits |
|-----------------|---|------|----------|---------------|
| TC              | <a href="#">MEC-E7007 Factory Project (mandatory)</a>                     | 5    | 1        | 5             |
|                 | <i>Select 1 of the following:</i>   |      | 1        | 5             |
|                 | <a href="#">ELEC-E8102 Distributed and Intelligent Automation Systems</a> | 5    | 1        |               |
|                 | <a href="#">ELEC-E8714 Sustainable Electronics</a>                        | 5    | 1        |               |
|                 | <a href="#">MEC-E1001 Mechanical Engineering in Society</a>               | 5    | 1        |               |
|                 | <a href="#">ELEC-E8103 Modelling, Estimation and Dynamic Systems</a>      | 5    | 1        |               |
| SC              | <a href="#">MEC-E1090 Quality Management and Metrology</a> (mandatory)    | 5    | 1        | 5             |
| Other           | <a href="#">LC-XXXX Compulsory language course</a>                        | 3    | 1        | 3             |
| I&E             | Centrally organized summer school   | 5    | 1*       | 5             |
|                 | <a href="#">TU-E4100 Startup Experience</a>                               | 9    | 1        | 9             |
|                 | <a href="#">TU-C2080 Entrepreneurship Essentials</a>                      | 1    | 1        | 3             |
| MT              | Master thesis   | 30   | 2        | 63            |

## Recap

| Type of modules | ECTS in S1 | ECTS in S2 | ECTS in S3 | ECTS in S4 | Total credits |
|-----------------|------------|------------|------------|------------|---------------|
| TC              | 20         | 15         | 10         |            | <b>45</b>     |
| SC              | 5          | 5          | 5          |            | <b>15</b>     |
| I&E             | 5          | 10         | 15         |            | <b>30</b>     |
| MT              |            |            |            | 30         | <b>30</b>     |
| English         |            |            | 3          |            | <b>3</b>      |
| Total           | 30         | 30         | 33         | 30         | <b>123</b>    |

## Zero Defect Manufacturing for Circular Economy Programme

- Study plan -

Aalto - Grenoble collaboration

### General structure of the EIT-M Master Programme

| Type of modules                             | Total credits for EIT-M Master | Total credits 1 <sup>st</sup> year | Total credits 2 <sup>nd</sup> year |
|---|--------------------------------|------------------------------------|------------------------------------|
| Technical courses (TC)                      | 45                             | 40-50                              | 10-20                              |
| Specialization courses (SC)                 | 15                             |                                    |                                    |
| Innovation & entrepreneurship courses (I&E) | 30                             | 10-20                              | 10-20                              |
| Master thesis (MT)                          | 30                             | 0                                  | 30                                 |
| Tot   | 120                            | 60                                 | 60                                 |

### Entry university Aalto – exit university Grenoble INP

#### 1<sup>st</sup> year - Aalto

| Type of modules                                       | Course code and name at Aalto                              | ECTS | Semester | Total credits |
|---|--|------|----------|---------------|
| TC & SC   | <i>Compulsory courses</i>                                  |      |          | 15 ECTS       |
|   | <a href="#">MEC-E1003 Machine Design Project</a>           | 5    | 1        |               |
|   | <a href="#">MEC-E7006 Advanced Manufacturing</a>           | 5    | 2        |               |
|   | <a href="#">MEC-E1090 Quality Management and Metrology</a> | 5    | 1        |               |
|   | <i>Elective courses (select at least 30 ECTS)</i>          |      |          | 30 ECTS       |
|   | <a href="#">MEC-E1080 Production Engineering</a>           | 5    | 1        |               |
|   | <a href="#">MEC-E6002 Welding Technology and Design</a>    | 5    | 2        |               |
|   | <a href="#">MEC-E7001 Production Systems Modeling</a>      | 5    | 2        |               |
|   | <a href="#">MEC-E7002 Manufacturing Methods I</a>          | 5    | 2        |               |
|   | <a href="#">MEC-E7003 Manufacturing Methods II</a>         | 5    | 2        |               |
| <a href="#">MEC-E7005 Advanced Casting Technology</a> | 5  | 2    |          |               |

|       |   |   |        |         |
|-------|---|---|--------|---------|
|       | <a href="#">CS-E4710 Machine Learning: Supervised Methods</a>             | 5 | 1      |         |
|       | <a href="#">CS-E4800 Artificial Intelligence</a>                          | 5 | 2      |         |
|       | <a href="#">CS-E4850 Computer Vision</a>                                  | 5 | 1      |         |
|       | <a href="#">CS-E5340 Introduction to Industrial Internet (TBC)</a>        | 5 | 2      |         |
|       | <a href="#">ELEC-E5710 Sensors and Measurement Methods</a>                | 5 | 2      |         |
|       | <a href="#">ELEC-E8105 Non-linear Filtering and Parameter Estimation</a>  | 5 | 2      |         |
|       | <a href="#">ELEC-E8113 Information Systems in Industry</a>                | 5 | 1      |         |
|       | <a href="#">ELEC-E8125 Reinforcement learning</a>                         | 5 | 1      |         |
|       | <a href="#">MS-E2112 Multivariate Statistical Analysis</a>                | 5 | 2      |         |
|       | <a href="#">37E10500 Project Management and Consulting Practice</a>       | 6 | 1      |         |
|       | <a href="#">TU-E2013 Service Operations Management</a>                    | 5 | 2      |         |
|       | <a href="#">TU-E2020 Advanced Operations Management</a>                   | 4 | 1      |         |
|       | <a href="#">ELEC-E8102 Distributed and Intelligent Automation Systems</a> | 5 | 1      |         |
|       | <a href="#">ELEC-E8110 Automation Software Synthesis and Analysis</a>     | 5 | 2      |         |
|       | <a href="#">ELEC-E8111 Autonomous Mobile Robots</a>                       | 5 | 2      |         |
|       | <a href="#">ELEC-E8115 Micro- and Nano Robotics</a>                       | 5 | 2      |         |
|       | <a href="#">ELEC-E8116 Model-Based Control Systems</a>                    | 5 | 1      |         |
|       | <a href="#">ELEC-E8126 Robotic manipulation</a>                           | 5 | 2      |         |
| Other | LC-XXXX Compulsory foreign language course                                | 3 | any    | 3 ECTS  |
| I&E   | <a href="#">25E50000 Venture Ideation</a>                                 | 6 | 1      | 15 ECTS |
|       | <a href="#">TU-E4100 Startup Experience</a>                               | 9 | 1 or 2 |         |

## 2<sup>nd</sup> year - Grenoble INP

| Type of modules            | Grenoble INP courses                                | ECTS | Semester | Total credits |
|----------------------------|---|------|----------|---------------|
| TC<br>(2 choices out of 3) | AI for production systems                           | 5    | 3        | 10            |
|                            | Smart analytics for big data                        | 5    | 3        |               |
|                            | Digital chain for industry 4.0, including VR and AR | 5    | 3        |               |
| SC<br>(1 choice out of 2)  | Sustainable manufacturing                           | 6    | 3        | 6             |
|                            | Advanced LCA for production systems                 | 6    | 3        |               |
| I&E<br>(all 3 mandatory)   | Centrally organized summer school                   | 5    |          | 14            |
|                            | Operational excellence in R&D                       | 5    | 3        |               |
|                            | Innovation challenge                                | 4    | 3        |               |
| MT                         | Master thesis                                       | 30   | 4        | 30            |

## Recap

| Type of modules | ECTS in S1 | ECTS in S2 | ECTS in S3 | ECTS in S4 | Total credits |
|-----------------|------------|------------|------------|------------|---------------|
| TC              | 15         | 20         | 10         |            | 45            |
| SC              | 5          | 5          | 6          |            | 15            |
| I&E             | 9          | 9          | 14         |            | 32            |
| MT              |            |            |            | 30         | 30            |
| Total           | 29         | 34         | 30         | 30         | 122           |