

# Royal Military Academy

## Guide for international students

*Welcoming students - Changing lives - Opening minds*





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▪ Rector's welcome words

Dear student,  
Dear trainee,

*Welcome to the Royal Military Academy of Belgium!*

*Today, if you read these lines, it is because you are one of us. We are glad you joined our academy this year to study, work and evolve together with our cadets and trainees.*

*The RMA is a military institution of university level entitled to deliver bachelor, master and doctoral degrees in accordance with the Bologna process. Leading scientific research linked to Defence interests is also paramount as well as expertise related to the civil and military society.*

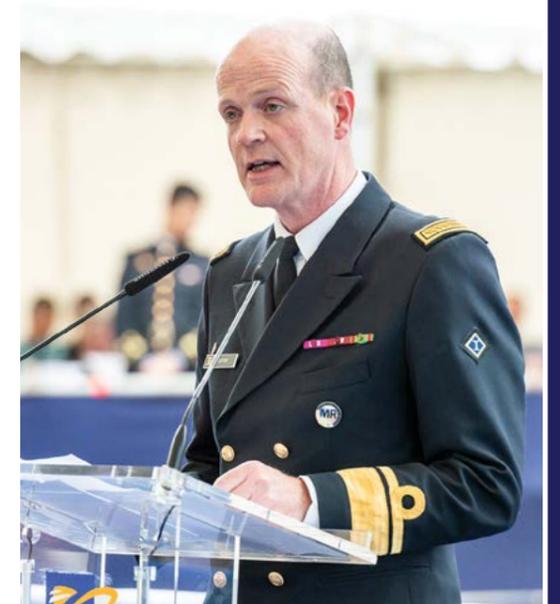
*Loyal to our primary mission, we incorporate military, physical and character training into our academic programme allowing our graduates to fully taking on their role as leaders or managers in the Belgian Defence.*

*The mission of the RMA has always been to train and educate officers by enabling them to command and take charge in complex situations in favour of the national and international community. Hence, our operating mode and our structures are in constant evolution in order to cope with the ever-mutating society we are living in.*

*Internationalisation and globalisation is not a choice anymore... it is a fact and became a necessity. In this increasingly globalised world, it is important to promote an international dimension in all areas of expertise. Therefore, the RMA decided to develop their international offer by incorporating foreign students and trainees to its education programmes and by increasing mobility of cadets, teaching and research staff through Europe and abroad. Thus, widening our education network and establishing a series of mutually beneficial partnerships.*

*This international student guide, which includes practical information regarding the RMA, our country and life in Belgium, should help you during your first contacts within our academy, Belgium, Brussels and our fellow citizens.*

*I wish you a successful and profitable experience,*



Yves Dupont Rear Admiral, MSc Eng  
Commander and rector  
Royal Military Academy





## • General information about Belgium

(Ref.: Belgian Foreign Affairs website, Belgian Tourist Office website and Wikipedia website)

### A brief history:



#### • Revolution and independence:

At the Congress of Vienna, in 1815, Belgium (The Southern Netherlands) and the Northern Netherlands (Holland) were united to form one State. This new state was ruled by King William I. Although his policy was beneficial to the Belgian bourgeoisie, there was protest. The Catholics objected to the interference of the protestant king in clerical matters. The Liberals demanded more freedom. In 1828, Catholics and Liberals drew up a concerted programme of demands. The association between Catholics and Liberals was called unionism.

After a series of incidents, the revolution erupted in Brussels in 1830. William I sent in his troops, but they were expelled on September 27th, 1830. The rebels received support from volunteers outside the city. Following this rising, Belgium separated from the Northern Netherlands. A provisional government declared independence on October 4th, 1830.

On November 3th of the same year, a National Congress was

elected by an electorate of 30,000 men, who paid a given level of taxes or who had special qualifications. On February 7th, 1831 the national congress adopted a constitution which, for its time, was very progressive.

#### • 1830 to 1908:

A diplomatic conference on the future of Belgium opened in London on the November 4th. The great powers of the time recognised the secession of Belgium from the (Northern) Netherlands. Leopold I of Saxe-Coburg became the first King of the Belgians (1831 - 1865). In 1865 he was succeeded by his son Leopold II (1865 - 1909). Under their reign, Belgium became the second most important industrial power. Both kings wanted to secure Belgium's economic independence by promoting colonial expeditions, but they were not successful in this until the end of the 19th century. It was at this time that Leopold II backed expeditions by Henry Stanley to the Congo basin. He entered into agreements with local chiefs, which resulted in a confederation of states. At first the Belgian government and parliament had no hand in the king's operations. Since Leopold II had been the first occupant of areas in Central Africa, he held a strong position at the Conference of Berlin in 1884. His demands were met. In 1885, the Belgian parliament agreed that Leopold II should become the head of state of the Congo. In 1908, control of Congo was transferred to the Belgian state.

#### • World Wars:

Although the great powers forced Belgium to remain neutral when it became independent, it could not escape World War I. The Belgian army under the command of King Albert I (1909 - 1934) was too small and

## • General information about Belgium

not a match for the Germans, it nevertheless could manage to halt the enemy at the riverbanks of the Yser. Belgium suffered a lot during the war. The Yser region was laid waste.

The years after the war were very difficult. The international economic crisis affected the country. When Adolf Hitler came to power in Germany, the dangers posed by that country rose again. From 1936, onwards Belgium took a neutral stance, just as it had done before the 1914 - 1918 war, but Germany invaded again on May 10th, 1940. After 18 days king Leopold III, (1934 - 1951) decided to capitulate. This decision provoked a rupture with the government. After the war, the royal question dominated politics. In 1951 Leopold III abdicated in favour of his son Baudouin I. This king reigned until his death in 1993. On August 9th 1993, his brother Albert II became the sixth King of the Belgians.

### A federal state:

The question of relations between the communities has played a highly important part in recent Belgian history. Following six state reforms, Belgium was transformed into a federal state. The political scene is also dominated by economic problems and increased internationalisation. Belgium played an important role in the creation of the Belgian-Luxembourg Economic Union, the Benelux and the European Union. As a member of the United Nations, and in the service of world peace, Belgium often sends its troops on peace missions or sends its observers across the world.

#### • Facts about Belgium:

<b>Official name</b>	Kingdom of Belgium
<b>Head of State</b>	King Philippe
<b>Prime Minister</b>	Alexander De Croo
<b>Capital</b>	Brussels
<b>Flag</b>	
<b>Motto</b>	Unity makes Strength
<b>Government</b>	Federal Parliamentary Constitutional Monarchy
<b>Area</b>	30.688 km <sup>2</sup>
<b>Population (2021)</b>	11.507.163 inhabitants
<b>Official languages</b>	Dutch, French and German
<b>Religion</b>	Christian (61%), None (32%), Islam (5%), Other (2%)
<b>National Day</b>	21 July
<b>Currency</b>	Euro (EUR)
<b>Border countries</b>	France, Germany, Luxemburg, The Netherlands
<b>Members of</b>	European Union, NATO, United Nations...
<b>Time zone</b>	GMT+1
<b>Summer time zone</b>	GMT+2 (end of March to end of October)
<b>Weights and measures</b>	Metric system



## ▪ General information about Belgium

<b>Domestic electricity</b>	220-230 volts
<b>Country code</b>	BE
<b>Calling code</b>	+32

[https://www.belgium.be/en/about\\_belgium/country/belgium\\_in\\_nutshell/filing\\_card\\_belgium](https://www.belgium.be/en/about_belgium/country/belgium_in_nutshell/filing_card_belgium)

### Geography and climate:

Belgium is situated in the west of Europe, bordered to the north by the Netherlands, to the east by Germany and the Grand Duchy of Luxembourg and to the south and the west by France. Although its surface area of 30,688 km<sup>2</sup> makes it a small country, its location has made it the economic and urban nerve centre of Europe.

Belgium has three main geographical regions; the coastal plain in the northwest and the central plateau both belong to the Anglo-Belgian Basin, and the Ardennes uplands in the southeast to the Hercynian orogenic belt. The Paris Basin reaches a small fourth area at Belgium's southernmost tip, Belgian Lorraine.

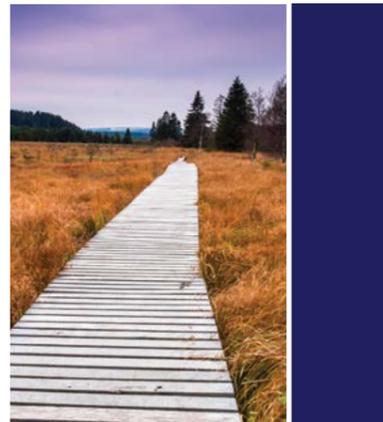
The coastal plain consists mainly of sand dunes and polders. Further inland lays a smooth, slowly rising landscape irrigated by numerous waterways, with fertile valleys and the north eastern sandy plain of the Campine (Kempen). The thickly forested hills and plateaus of the Ardennes are more rugged and rocky with caves and small gorges. Extending westward into France, this area is eastwardly connected to the Eifel in Germany by the High Fens plateau, on which the Signal de Botrange forms the country's highest point at 694 m.

The climate is maritime temperate with significant precipitation in all seasons, like most of northwest Europe. The average temperature is lowest in January at 3 °C and highest in July at 18 °C. The average precipitation per month varies between 54 mm for February and April, to 78 mm for July.

### Tourism:

Whether you are looking for a weekend break or a longer trip, Belgium has a lot to offer to tourists. If you enjoy walking, sports and the outdoors, the Ardennes, which are the green heart of Belgium, are your place to go. If you prefer the beach, water sports, sailing or cycling, the seaside is calling you.

Belgium also has splendid art cities, even if you are not a fan of history, architecture or culture; and Belgians love gastronomy. They love good food and will invite you to taste their special beers and cheeses and obviously their chocolate, sweets, endives, beef stew, speculoos and much more... of course, the fries are simply legendary.



## ▪ General information about Belgium

Above all, Belgium is a place of fun: it has a very vibrant cultural scene (exhibits, concerts, festivals, theatre, dance...) and its night life is a big celebration.

### • The Coast:

The coast's 65 kilometre long stretch of sandy coastline has 15 resorts, each with its own character and unique atmosphere. The sandy beaches are ideal for children. The beaches shelve gently out to sea, and lifeguards ensure everyone's safety.

The Belgian coast offers a wide range of sport and recreation facilities: here you can hire a bicycle or a buggy, or go sailing or fishing. The wide beach is ideal for ball games, horse riding and beach surfing.

The summer months are the busiest period for the coast. However, other seasons have their charm too, even if sunbathing is not part of it. There are plenty of alternatives on the coast. Close by, there is Bruges, one of Belgium's finest cities of art. A visit to this historic city is a must.

### • The Ardennes:

Situated in the south-east of Belgium, they are one of nature's unspoilt areas, rich in fauna and flora, with vast forests of broadleaf and fir, hills and fast flowing rivers. Visitors can wander through the many picturesque villages nestling in the valleys where traditions and folklore still live on, and where the region's arts and crafts can be enjoyed.

Springtime in the Ardennes is the season for walking, cycling, fishing, canoeing and kayaking. Horse riding, climbing and mountain biking are other examples of popular sports in the Ardennes. The keen mountaineer has an exciting choice of challenges. During wintertime, the Ardennes are a fun place for cross-country skiing, sledging or snow scooter racing. There is action, even underground. Some of the caves are certainly worth a visit.

Amongst the greenery lie the silent witnesses of the past of the Ardennes, such as castles, forts and citadels. They come to life again during re-enactment events and displays where knights and their shield bearers turn the neighbourhood into a battlefield.

### • Cities of Art:

Belgium has a remarkable number of cities of art: Bruges, Brussels, Antwerp, Bergen, Liege, Ghent, Namur... Each of these cities have a lot in store for you, and is worth a city trip. If you like the idea of being face to face with the paintings of Rubens, Ensor or Van Eyck; the Royal Museum of Fine Arts in Antwerp is your place. You can also go straight to the Rubens House Museum. Alternatively, a visit to the house of the Art Nouveau architect Victor Horta, in Brussels, also has its appeal. Perhaps you simply prefer to stroll through the picturesque little streets of Brussels, Bruges or Ghent.



## ▪ General information about Belgium

Actually, all Belgian cities of art in Belgium will offer you a pleasant and interesting stay. What is more, this not only applies to museums and monuments. After a visit to the museum, the enjoyment of a delicious meal with a glass of wine or Belgian beer in one of the many restaurants or brasseries is a must. When in Antwerp, you can take a trip in a horse-drawn carriage through the old city centre. In Bruges, a boat trip along the canals will undoubtedly go down well. In the evening, you will then be ready for a dazzling cultural program or for a night out in the convivial surroundings of our pubs.

### Belgian gastronomy

Belgians are "bon vivants". They like to eat and drink and Belgian cuisine is far more than the traditional mussels and fries. The range of Belgian flavours is broad and varied, from sweets to savouries.

In the morning, you can start your day with a delicious slice of *cramique* (raisin bread) or *craquelin* (sweet bread). For those who love tradition, there is also the so-called "Greek bread", which isn't in the least bit Greek but a 100% Brussels specialty!

Later in the day, a Belgian person will of course want to start the aperitif with a good beer. Whether it is lager or dark, or perhaps amber, white or fruity, beer reigns supreme in Belgium. Particularly if you taste one of the six Trappist beers, brewed in an abbey where monks carry out or oversee the production process.

As a starter, Flemish-style asparagus is much appreciated: who can resist the delicious combination of asparagus covered in melted butter, minced hard-boiled eggs, parsley and lemon? If you are at the seaside, you should try shrimp croquettes or tomatoes stuffed with shrimps. In the south of the country, you can enjoy a Liège-style salad with beans, bacon and potatoes or rabbit sauce meatballs, with Liège syrup and brown sugar.

In Brussels, you have more than just cabbage. People like whelks, sea snails eaten at food stalls, or *stoemp*, a dish of mashed potatoes with vegetables.



Bruges

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Traditional Belgian dishes are hearty: rabbit cooked in Gueuze, Flemish beef stew, waterzooi with chicken or fish, stewed eel in a green herb sauce, a meat roulade dish called "headless birds", *chicons au gratin*, "américain" with fries... There are many delicious dishes, some with strange names, to discover and savour.

Afterwards, you can taste one of many Belgian cheeses; you will be surprised by their quality and diversity. To finish off, a good waffle from Liège or Brussels. Waffles from Liège contain lovely, crunchy pearl sugar. Those from Brussels are fluffier and rectangular. Some Belgian pralines, *cuberçons*, *speculoos* or *babelettes* could also tempt you... In all cases, our award-winning whiskey or numerous jeneveres will help digestion!

### Economy

Belgium's strongly globalised economy and its transport infrastructure are integrated in the rest of Europe. Its location at the heart of a highly industrialised region helped Belgium to rank in the top 20 of the largest trading nations. The economy is characterised by a highly productive work force, high GNP and high exports per capita. Belgium's main imports are raw materials, machinery and equipment, chemicals, raw diamonds, pharmaceuticals, food, transportation equipment, and oil products. Its main exports are machinery and equipment, chemicals, finished diamonds, metals and metal products, and foodstuffs. The Belgian economy is also heavily service-oriented.

As one of the founding members of the European Union, Belgium strongly supports an open economy and the extension of the powers of EU institutions to integrate member economies. Since 1922, through the Belgium-Luxembourg Economic Union, Belgium and Luxembourg have become a single trade market with customs and currency union.

Belgium was the first continental European country to undergo the Industrial Revolution, in the early 19th century. Liège and Charleroi rapidly developed mining and steelmaking, which flourished until the mid-20th century in the Sambre and Meuse valley and made Belgium among one of the three most industrialized nations in the world from 1830 to 1910. However, by the 1840s, the textile industry of Flanders was in severe crisis, and the region experienced famine from 1846 to 1850.

After World War II, Ghent and Antwerp experienced a rapid expansion of the chemical and petroleum industries. The 1973 and 1979 oil crises sent the economy into a recession; it was particularly prolonged in Wallonia, where the steel industry had become less competitive and experienced serious decline. In the 1980s and 1990s, the economic centre of the country continued to shift northwards and is now concentrated in the populous Flemish Diamond area.





## ▪ General information about Belgium

From 1832 until 2002, Belgium's currency was the Belgian franc. Belgium switched to the euro in 2002, with the first sets of euro coins being minted in 1999. The standard Belgian euro coins designated for circulation show the portrait of the monarch (first King Albert II, since 2013 King Philippe).

Despite an 18% decrease observed from 1970 to 1999, Belgium still had the highest rail network density within the European Union in 1999 with 113.8 km for 1 000 km<sup>2</sup>. On the other hand, during the same period, 1970–1999, the motorway network has seen a huge growth (+56%). In 1999, the density of km motorways per 1000 km<sup>2</sup> and 1000 inhabitants amounted to 55.1 and 16.5 respectively and were significantly superior to the EU's of 13.7 and 15.9.

Belgium experiences some of the most congested traffic in Europe. In 2010, commuters to the cities of Brussels and Antwerp spent respectively 65 and 64 hours a year in traffic jams. Like in most small European countries, more than 80% of the airways traffic is handled by a single airport, Brussels Airport. The ports of Antwerp and Zeebrugge (Bruges) share more than 80% of Belgian maritime traffic, Antwerp being the second European harbour with a gross weight of goods handled of 115 988 000 t in 2000 after a growth of 10.9% over the preceding five years. In 2016, the port of Antwerp handled 214 million tons after a year-on-year growth of 2.7 %.

At present, there is an economic gap between Flanders and Wallonia. Wallonia was historically wealthy compared to Flanders, mostly due to its heavy industries, but the decline of the steel industry post-World War II led to the region's decline, whereas Flanders economy rose. Since then, Flanders is among the wealthiest regions in Europe. This division affects mutual perception in addition to the already-existing language division.

## Science

Contribution to the development of science and technology has appeared throughout the country's history. The 16th century Early Modern flourishing of Western Europe included cartographer Gerardus Mercator, anatomist Andreas Vesalius, herbalist Rembert Dodoens and mathematician Simon Stevin among the most influential scientists.

Chemist Ernest Solvay and engineer Zenobe Gramme (École industrielle de Liège) gave their names to the Solvay process and the Gramme dynamo, respectively, in the 1860s. Bakelite was developed in 1907–1909 by Leo Baekeland. Ernest Solvay also acted as a major philanthropist and gave its name to the Solvay Institute of Sociology, the Solvay Brussels School of Economics and Management and the International Solvay Institutes for Physics and Chemistry, which are now, part of the Université libre de Bruxelles. In 1911, he started a series of conferences, the Solvay Conferences on Physics and Chemistry, which have had a deep impact on the evolution of quantum physics and chemistry. A major contribution to fundamental science was also due to a Belgian, Monsignor Georges Lemaître (Catholic University of Louvain), who is credited with proposing the Big Bang theory of the origin of the universe in 1927.

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Three Nobel Prizes in Physiology or Medicine were awarded to Belgians: Jules Bordet (Université libre de Bruxelles) in 1919, Corneille Heymans (University of Ghent) in 1938 and Albert Claude (Université libre de Bruxelles) together with Christian de Duve (Université catholique de Louvain) in 1974. François Englert (Université libre de Bruxelles) was awarded the Nobel Prize in Physics in 2013. Ilya Prigogine (Université libre de Bruxelles) was awarded the Nobel Prize in Chemistry in 1977. Two Belgian mathematicians have been awarded the Fields Medal: Pierre Deligne in 1978 and Jean Bourgain in 1994.

## Cost of living

The table underneath provides you with an example of common product prices in Belgium.

### • Current as of May 2021

Item	Price in euro
<b>Food</b>	
1 kg (2 lb.) of potatoes	€1.39
1 kg (2 lb.) of apples	€2.29
12 eggs, large	€3.92
1 liter (1 qt.) of whole fat milk	€0.94
1 kg (2 lb.) of tomatoes	€1.91
0.5 l (16 oz) domestic beer in the supermarket	€1.97
<b>Transportation</b>	
Monthly ticket public transport	€50
Taxi trip on a business day, basic tariff, 8 km. (5 miles)	€21
<b>Personal care</b>	
Tube of toothpaste	€2.29
4 rolls of toilet paper	€1.70
Deodorant, roll-on (50ml ~ 1.5 oz.)	€3.70
Hair shampoo 2-in-1 (400 ml ~ 12 oz.)	€3.80
<b>Entertainment</b>	
2 tickets to the movies	€21
Basic dinner out for two in neighbourhood pub	€49

→ Please visit the website of Expatistan to see more products: <https://www.expatisitan.com/cost-of-living/brussels>

→ Please also visit Numbeo website, which allows you to compare the costs of Brussels with your home city and country: <https://www.numbeo.com/cost-of-living/in/Brussels>



## ▪ General information about Belgium

### The Capital: Brussels

*(Ref.: Belgian Foreign Affairs website, Belgian Tourist Office website and Wikipedia website)*

Brussels, officially the Brussels-Capital Region is a region of Belgium comprising 19 municipalities, including the City of Brussels, which is the capital of Belgium. The Brussels-Capital Region is located in the central portion of the country and is part of both the French Community of Belgium and the Flemish Community, but is separate from the Flemish Region (in which it forms an enclave) and the Walloon Region. Brussels is the most densely populated and the richest region in Belgium in terms of GDP per capita. It covers 161 km<sup>2</sup>, a relatively small area compared to the two other regions, and has an internal population of 1.214.550 million people.

Brussels grew from a small rural settlement on the river Senne to become an important city-region in Europe. Since the end of the Second World War, it has been a major centre for international politics and the home of numerous international organisations, politicians, diplomats and civil servants. Brussels is the capital of the European Union and hosts a number of principal EU institutions, including its administrative-legislative, executive-political, and legislative branches (though the judicial branch is located in Luxembourg, and the European Parliament meets for a minority of the year in Strasbourg) and its name is sometimes used metonymically to describe the EU and its institutions. The secretariat of the Benelux and headquarters of NATO are also located in Brussels. As the economic capital of Belgium and one of the top financial centres of Western Europe with Euronext Brussels, it is classified as an Alpha global city. Brussels is a hub for rail, road and air traffic, sometimes earning the nickname "Crossroads of Europe". The Brussels Metro is the only rapid transit system in Belgium. In addition, both its airport and railway stations are the largest and busiest in the country.

Historically Dutch-speaking, Brussels saw a language shift to French from the late 19th century. The Brussels-Capital Region is officially bilingual in French and Dutch, even though French is now the de



Brussels

## ▪ General information about Belgium

facto main language with over 90% of the population speaking it. Brussels is also increasingly becoming multilingual. English is spoken as a second language by nearly a third of the population and a large number of expatriates speak other languages.

Brussels is known for its cuisine and gastronomy, as well as its historical and architectural landmarks; some of them are registered as UNESCO World Heritage sites. Main attractions include its historic Grand Place, Manneken Pis, Atomium, and cultural institutions such as La Monnaie and the Museums of Art and History. Because of its long tradition of Belgian comics, Brussels is also hailed as a capital of the comic strip.



## • Studying at the Royal Military Academy

### Your contacts at the RMA

#### International office:

✉ [rma-international-office@mil.be](mailto:rma-international-office@mil.be)

☎ +32 (0)2 44 13 968  
+32 (0)2 44 13 982  
+32 (0)2 44 13 714

#### Internet links:

🌐 [www.rma.ac.be](http://www.rma.ac.be)

📷 [ERM.KMS](#)

f [royal\\_military\\_academy](#)



## • Studying at the Royal Military Academy

### General information about the Royal Military Academy

The Royal Military Academy (RMA) is a military institution providing university level education and is responsible for the basic academic, military and physical training of future officers. The education and training is tailored to the needs of the Belgian Defence (Army, Air Force, Navy and Medical Service) and integrates the values of our society. The RMA is also in charge of the advanced training of officers throughout their career in the Belgian Defence Forces.

#### • An Officer's profession

The main task of the RMA is to educate and train officers who will be able to perform efficiently in diverse, complex and extraordinary circumstances. An officer must be able to lead men and women, and is embedded in local, national or international structures. In order to carry out its tasks and to execute its missions, an officer is assigned material means and, more importantly, human means. An officer must be able to evaluate complex situations correctly, to take appropriate decisions to reach given objectives, to exert authority by giving appropriate orders, to pay attention to his personnel and their surroundings, and to command respect by his attitude and his actions.

Embodying all those qualities and skills by nature is a rare occurrence. That is the reason why education at the RMA focuses as much on academic knowledge as physical, mental and character development. This all-round education aims at forging the military leaders needed by our armed forces. The RMA takes pride in the development of our cadets in order to prepare them to lead in tough conditions, sometimes straight after graduation.

#### • A constantly evolving profession

It would be wrong to assume basic training as sufficient to build a complete career. To ensure the most current and accurate information and to keep in touch with the rapid developments of present-day society, executives need to continuously update their knowledge and extend their competencies. This is equally true for Defence; and this is the reason the Royal Military Academy offers advanced and professional courses, enabling officers to carry out staff functions efficiently and to take command in national and international contexts.

The RMA also offers the structures and organises advanced third-cycle courses allowing students to acquire a PhD or an additional master degree.

Finally, when needed in one's career and assignments, the RMA offers training in specific domains as public tender offers and law of armed conflict.

Many courses and training sessions are not exclusively aimed at military and civilian Defence personnel, but are also open to civilians from private and public sectors.

### History of the Academy

#### • More than 175 years in Service of the Nation

In 2009, the Royal Military Academy celebrated its 175th anniversary. Not long after the independence of Belgium in 1830, King Leopold I got convinced of the need for a professional corps of officers. The young



## - Studying at the Royal Military Academy

King himself had served as an officer in the Russian Army and fought against the Napoleonic armies. There was still much tension between Belgium and the Netherlands. Although there was a ceasefire, no peace treaty was signed yet. The necessity for well-educated officers imposed itself. King Leopold I had great admiration for the French "Ecole Polytechnique". In 1834, Lieutenant-Colonel Jean-Jacques Edouard Chapelié, a former student of the Ecole Polytechnique, was assigned with the mission of establishing a school for the education of Belgian officers. He became the first commander of the Military Academy.

The Royal Military Academy was founded in 1834 to train prospective executives of the fledgling Belgian Army and especially officer-engineers for the artillery and the engineering corps. The command of the academy was entrusted to the French Lieutenant-Colonel Chapelié, whose mission was to base the training and structures of the Academy on the model of the French "Grandes Ecoles" and more in particular that of the famous "Ecole Polytechnique".

Since its establishment, the RMA has constantly evolved in order to adapt training to the needs of the Armed Forces and to maintain the university level education in accordance with the granted degrees.

- **The campus: one hundred years old and still modern**

After its foundation, the RMA was first housed in a building in the Rue de Namur, just behind the Royal Palace in Brussels. The difficult early days of the Academy at the Porte de Namur begin with the French generals Chapelié and Nerenburger and with the first Belgian academy-commander Liagre. An Academy for "Special Weapons": Artillery and Engineers and later on for so-called "Ordinary Weapons": Infantry and Cavalry. Eminent professors teach at the Academy: Adolphe Quetelet, Jean-Servais Stas, Jean-Baptiste Madou and even Charles De Coster (Till Eulenspiegel).

Soon this building became too small, and in 1874, the RMA moved to the La Cambre Abbey, where it kept on growing. The Academy was temporarily housed in a former abbey at the Cambre Woods. Dozens of drawings of the cadets show us their daily lives in the sleeping quarters and dining halls, in class and study, but also the "Infection", the duels, the containment under disciplinary action, the abundant Pampou meals, the "accidents" in the duck pond...

The royal princes Baudouin and Albert were prepared in our Academy for their future tasks. Scientific



## - Studying at the Royal Military Academy

and didactic tools and courses prove that the Academy closely followed the latest inventions (electricity, telegraph, telephone...). Twenty countries entrust us the education of their officers, while our alumni distinguish themselves abroad: 300 of them in the Congo, others in Thailand, two of them escorted Baron de Gerlache during his explorations of Antarctica.

For the third time in its 75-year of existence, the RMA had to search for new accommodation. The location was found in a quiet, green area of the capital, along the Cinquantenaire Park and its exhibition halls. King Leopold II then returns the Academy to Brussels and constructs prestigious buildings on a campus that stretches over 5 ha. Later on, important institutions would be established in the same neighbourhood, which would turn Brussels into the Capital of Europe.

The new buildings were inaugurated in 1909, and met the requirements of the age, both as regards to the functionality of a higher education institution and an architectural design in harmony with its expanding neighbourhood. General Lemans demands the highest quality from the students, but also from the professors. The barbaric German invasion of August 1914 abruptly ends the Belle Epoque dream: the Germans occupy our Academy and leave it in ruins. Three hundred students and alumni are killed in the terrible trench war.

By appointing a former promotion colleague as Academy Commandant and by letting his children Leopold and Charles (the later King and Prince Regent) study in the RMA, King Albert I shows his determination to get our Academy back on its feet. The Academy gets its own flag, a coat of arms and motto, and from 1936, we may call ourselves "royal". The regained high level of our training brings visitors from all around the world. New uniforms and new traditions are introduced: like the Sword of the King and the RMA annual ball.

Students and alumni distinguish themselves during the Eighteen-Day Campaign, the escapes from the prison camps, fighting with Allied troops and especially in the Resistance and the Secret Army. Despite the atrocities of the Gestapo and the hell of the concentration camps, they keep burning the light of hope.

Against the Anglo-Saxon pressure, and with the support of the professors E. Franckx and P. Cauchie, General Beernaerts can enforce his vision: the post-war RMA will provide both an academic and a practical military training. Besides a number, the promotions now get a name. Earlier traditions are revived: the Sword of the King, the annual ball, the Pampou. From 1978, female students make their entrance. Richly illustrated promotion books, student leaflets and stickers show not only the new technical possibilities, but also the assertiveness of the new generations. Rapid scientific developments relating to nuclear physics, photogrammetry, ballistics, chemistry, computer science, mechanics, telecommunications, and others, force our chairs into a continuous adaptation of programmes and courses. In 1984, the RMA celebrates its 150th anniversary.

As a result of societal developments and the evolution of the Academy into a university-level institution, either a new move or a thorough renovation became unavoidable. The latter option was chosen, so that today you are welcomed on a campus that, even though it is a hundred years old, is completely renovated and modernised.

Despite pressure from the European Union, our out-dated infrastructure is renovated in situ, expanded and adapted to the increased number of students (see our photo shoot on the RMA infrastructure). The royal princes Philippe, Laurent and Amadeo got their education in the RMA. In this post-Cold War era foreign delegations from around the world visit our Academy, while foreign students and trainees from around 20 countries follow our courses.



## - Studying at the Royal Military Academy

### Student life at the Royal Military Academy

The Erasmus Program allows students to evolve in an international environment and to develop an international mindset by providing the possibility to integrate another institution and to discover other cultures and traditions. Therefore, at the Royal Military Academy (RMA) you will be plunged in a bath of traditions that find their origins in the institution's history. One of these traditions is the "Pampou", a traditional song known by every student at the RMA and which is performed with conviction during major events. In this song, the students complain about the strict diet and work required from them. But "Pampou" is also the name of a flyer distributed internally, in which students express their opinions and share their personal experiences, thereby serving as an escape channel for the students.

During your stay, in addition to the academic training, you will also have the opportunity to share the daily life of the RMA students, which is punctuated by sports sessions such as cross-country, swimming, triathlon, soccer, and many other activities, but also to take part in the preparation of numerous competitions within and outside of the RMA. Internally at the RMA, a competition involving several disciplines is also organized yearly, the Inter-Promotion, between the different promotions. Each year, the promotion that wins this competition receives the "Inter-Promotions Cup".

Regarding the military instruction offered at the RMA, the school works in cooperation with the EU and NATO member states. You will also have the opportunity to take part in the military ceremony that takes place every year at the end of September, during which the students who have successfully completed their military initiation phase receive their blue beret. This is also the time when the "golden boot" is awarded to the student who has achieved the best results in the military initiation phase.

A few days after this ceremony, takes place every year, the official opening of the academic year. The Commandant and Rector of the RMA officially declares the academic year open during a military ceremony that takes place nearby Parc du Cinquantenaire. The highest military authorities are invited to attend this ceremony, during which the RMA has the honour to welcome members of the Royal Family, as well as the Minister of Defense. This event, attended by more than 1000 spectators each year, arouses curiosity and is always a great success.

Traditionally, the new promotions of the Basic Education, who have just completed the military initiation phase, and the trainees of the Defense College are welcomed in the school during this parade.

Later in the evening, the King's Sword, a prestigious award, is given by a representative of His Majesty the King, and in some years personally by the King himself, to a student who has achieved the highest results in all aspects of his or her Bachelor's degree.

Then, each year at the end of September - early October, the students organize the traditional "Parade des Flambeaux", a ceremony during which the RMA alumni are invited, and during which second year students, called "dear alumni", symbolically hand over the "flambeau" to their first year godson(s). After this short ceremony, the students and alumni attend a reception where they can meet the new promotions.

*The School's motto, adopted in 1935, is a constant reminder for all students and Alumni of the purpose of the training "Rege duce pro jure et honore" which means that "Under the guidance of the King, [I fight] for the right and the honour."*



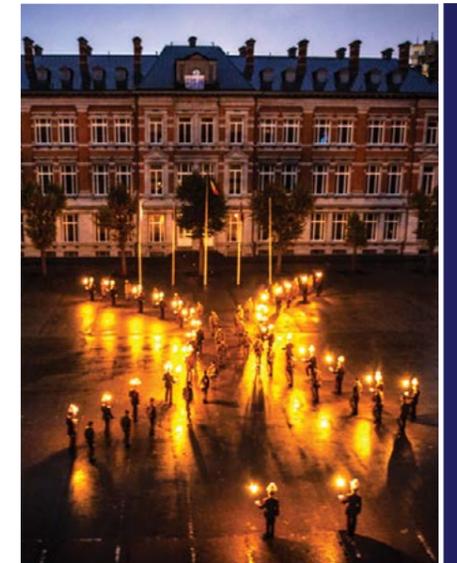
## - Studying at the Royal Military Academy

You will also be able to attend the swearing of the oath of the fourth year students who, officially on September 26, take the oath of office, "I swear fidelity to the King, obedience to the constitution and the laws of the Belgian people". This military ceremony is very emotional because not only does it represent the commissioning to the rank of Second Lieutenant or Ensign 2nd Class, but also because the families of the students are present.

Later in the year, you will have the opportunity to participate in the "international" week around March or April, which will end with the RMA annual gala ball. You will have the opportunity to dance a few steps of the traditional "Quadrille des Lanciers" and to sing the "Pampou".

For those who feel the soul of an artist, you will find your happiness in one of the four music groups that make up the "Music Band" which are the Pop Band, Fanfare, Drum Corps and DJ-team.

Finally, at the end of your training at the RMA, you will receive, like the Belgian students and trainees, your diploma, patent or certificate during an academic and/or military ceremony under the admiring eyes of your families





## Studying at the Royal Military Academy

Practical informations:

### Accommodation and meal:

Foreign students and trainees will be fully integrated in a promotion and will share the daily life of our cadets and trainees. They will be freely accommodated on the campus of the Royal Military Academy.

Meals can be purchased at the dining facilities of the RMA under the same conditions of our cadets; they receive a card that will grant them a discount on the meal on the campus. Furthermore, during spare time plenty of dining possibilities are offered outside of the campus.

### Campus facilities:

Education and training at the RMA is supported by our Campus infrastructure: Classrooms, auditoria, lecture halls and laboratories; Training and sports facilities: sports hall, gym, dojo, swimming pool, climbing wall and bouldering room, spinning room, squash courts, fencing room, obstacle course; Accommodation building: individual and two-persons rooms; Services: library, hairdresser, dry cleaning, dining facility, cafeteria; International room for foreign students and trainees.

### Sport:

For more information please call the following number:  +32 2 441 41 59



## ▪ Studying at the Royal Military Academy

### Application process for incoming students

**Nomination process:** Studies and exchange programmes at the Royal Military Academy are possible for institutions having signed a bilateral agreement with the RMA.

To participate in the Erasmus+ programme at the RMA, students are elected by their home institutions. Details of this process depend on the policy of the different brother institutions, but in any case the sending Institution should send a nomination to the following e-mail addresses:

- [rma-international-office@mil.be](mailto:rma-international-office@mil.be)
- [david.lecompte@mil.be](mailto:david.lecompte@mil.be)

Please note that the nomination should include student's names, e-mail address, study year and field at home university and other basic information.

### Application documents:

- Student Application Form
- Security Form
- Learning Agreement for Studies or traineeship
- Copy of ID card / passport

## ▪ Studying at the Royal Military Academy

### Educational offer

- The Faculty of Social and Military Sciences



History: apart from artillery and military engineering officers, the RMA has also been training officers from other branches since 1849. The originally practical training has evolved according to the concepts of leadership. The leaders of today do a lot more than simply issuing orders. They have to face ever-changing situations and constantly need to remain attentive and ready.

From 1949 onwards, the training was called "All Arms", but has since then evolved into a university level training at the Faculty of Social and Military Sciences. Studies last four years and yield a Master degree in Social and Military Sciences.

The curriculum does not only teach behavioural sciences (law, philosophy, psychology, sociology), but also specific military subjects (military technology, military history, leadership, international relations) and other universal subjects (mathematics, statistics, computer science, economy, management).

Thus, at the end of their education officers can efficiently and suitably control high-tech weapon systems and rapidly deploy in complex international contexts.

- Course Catalogue for the 1<sup>st</sup> Semester of the Master Programme in Social and Military Science

The master programme in social and military sciences is offered to cadets of the faculty of social and military sciences (SSMW). The programme is credited with 60 ECTS and scheduled over one academic year. Besides the academic courses, cadets have military and physical education.

The first semester of the master year is open to foreign students and accounts for 33 ECTS.

#### SSMW Master 1 Semester 1:

Common courses (15 ECTS) +  
Module E1 or Module E2 or Module E3 (18 ECTS)

Foreign cadets can remove 01 course of 03 ECTS.



**- Studying at the Royal Military Academy**

N°	Course code	Course title	ECTS
<b>Common module</b>			
1	BS904	Cultural dimensions of operations	3
2	DS902	Defence economics	3
3	BS907	Citizenship and military ethics II	3
4	EP901	Propulsion of military platforms	3
5	LS906	Leadership	3
<b>Total:</b>			<b>15</b>
<b>Defence and Security Technology (Module E1)</b>			
E11	TN911	Telecommunications and C4I	3
E12	TP912	Management of cybersecurity	3
E13	EP915	Applied mechanics	2
E14	WS913	Fire control and guided weapons	3
E15	SM914	Mechanics of materials and structures	3
E16a	SM921	Land vehicles propulsion, stability and performance	4
E16b	SM931	Aircraft propulsion, stability and performance	4
E16c	SM941	Ship propulsion, stability and performance	4
<b>Total:</b>			<b>18</b>
<b>Management Studies for Defence (Module E2)</b>			
E21	DS951	Supply chain management	6
E22	DS952	Project and program management	6
E23	DS953	Performance optimisation	6
<b>Total</b>			<b>18</b>
<b>Security Studies for Defence (Module E3)</b>			
E31	CS961	International conflicts in historical perspective	6
E32	CS962	Strategic studies	6
E33	CS963	Contemporary security issues	6
<b>Total</b>			<b>18</b>

**- Studying at the Royal Military Academy**

- In detail:

<b>Common courses - BS904 Cultural dimensions of operations</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and written exam
Teaching content	<p>The aim of this course is to better understand the complexities of contemporary conflicts and of military operations conducted both in remote operational theaters as in homeland operations.</p> <p>Based on case-studies related to contemporary military operations, this course will focus on the analysis of social and cultural dimensions surrounding the military environment and to what extent these dimensions exert a significant influence on the nature of the conflicts and on the approaches that are chosen in trying to resolve them.</p> <p>In a first part, this provides an overview of key conceptual elements of military culture.</p> <p>The second part looks at the practical implications of cultural dimensions in current conflicts. Cadets are divided into smallgroups of 2-3 students (TBD) and are allowed to choose one article (cleared by the Professor in the reader) that they would like to develop. They research the specific topic and then brief their findings to the class in a 30 minute presentation which is followed by a group discussion and additionally moderated by the Professor.</p>

<b>Common courses - DS902 Defence economics</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class
Evaluation	1 written evaluation and oral exam
Teaching content	<p>In this course, Defence economics, as a scientific discipline, is examined in its national, European and Atlantic dimensions.</p> <p>Chapter I identifies Defence as an external element of Security as a whole and describes its place in the nation's socio-political environment. All subsequent Chapters plunge their roots into the current events and their evolution.</p> <p>The contents presented below are therefore subject to change as events unfold:</p>



## - Studying at the Royal Military Academy

### Common courses - DS902 Defence economics

Teaching content	<ul style="list-style-type: none"> <li>- Chapter II. Public Finance, Defence budgets and expenditures? A historical and prospective analysis in the new area of Coroneconomics</li> <li>- Chapter III. The economic and industrial physiognomy of Defence</li> <li>- Chapter IV. Economic aspects of recent armed operations</li> <li>- Chapter V. The acquisition of Belgian major weapon systems since 2018</li> <li>- Chapter VI. The Defence economy and industry, new dimensions to the European Union</li> </ul>
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### Common courses - BS907 Citizenship and military ethics II

Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 oral evaluation and oral exam with written preparation or written part
Teaching content	<p>The theoretical part of the course is divided into 10 two-hour sessions. during the first two-hour session a general practical and theoretical introduction will be given. During the 9 following two-hour sessions a journal article or a book chapter covering a specific issue or subject in the domain of citizenship and/or military ethics will be treated. During the first period of each two-hour session the students will be asked to prepare the text, during the next period the text will be discussed in class. The main purpose of this approach is to enhance as much as possible the interactive process in class. It is up to the students to determine what will be discussed in class.</p> <p>The practice part of the course consists in individually preparing two articles. The individual preparation will be followed by an oral evaluation on the two articles.</p>

### Common courses - EP901 Propulsion of military platforms

Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<p>This course is divided as follow :</p> <ol style="list-style-type: none"> <li>1. Propulsion systems             <ol style="list-style-type: none"> <li>a. Propulsion systems criteria</li> <li>b. Types of propulsion systems</li> <li>c. Engine characteristics</li> </ol> </li> </ol>

## - Studying at the Royal Military Academy

### Common courses - EP901 Propulsion of military platforms

Teaching content	<ol style="list-style-type: none"> <li>2. Thermodynamics             <ol style="list-style-type: none"> <li>a. Thermodynamic principles</li> <li>b. Practical cycle calculations</li> </ol> </li> <li>3. Piston engines             <ol style="list-style-type: none"> <li>a. Generalities</li> <li>b. Connecting rod - crankshaft mechanism</li> <li>c. Two- and four stroke engines</li> <li>d. Engine components</li> <li>e. Combustion process</li> <li>f. Dynamics</li> <li>g. Fuel supply, lubrication and cooling</li> </ol> </li> <li>4. Turbomachinery             <ol style="list-style-type: none"> <li>a. Types of engines</li> <li>b. Performance</li> <li>c. Components</li> </ol> </li> </ol>
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### Common courses - ELS906 Leadership

Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class
Evaluation	written evaluation
Teaching content	The LS906 Leadership courses focuses on various very special and specific features of leadership. The methodology focuses on the self-Learning and teaching competencies of the students. It follows the LS815 Leadership course.

### Defence and Security Technology (Module E1) - TN911 Telecommunications and C4I

Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<p>This course introduces the domain of telecommunications and C4I. The following topics are covered:</p> <ul style="list-style-type: none"> <li>- Generalities on telecommunications</li> <li>- Spectral analysis</li> <li>- Analogue signals and modulations</li> <li>- Introduction to source coding</li> <li>- Transmission of numerical signals</li> <li>- SatCom</li> <li>- Tactical Communication Networks</li> <li>- VOIP (Voice Over IP)</li> <li>- EOIP (Everything Over IP)</li> </ul>



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**Defence and Security Technology (Module E1) - TN911 Telecommunications and C4I**

Teaching content	The theoretical concepts are illustrated by examples of civilian systems and applications from the world of defence & security. The concepts are used during the practice sessions (exercises).
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**Defence and Security Technology (Module E1) – EP912 Management of cybersecurity**

Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<p>Every army is increasingly relying on weapon systems that are highly technological and are each in fact a system of interconnected systems, all running software of some sort. Moreover this system of systems is most often connected to a command and control network.</p> <p>The “Management of cybersecurity” course therefore addresses all the topics that an officer should know to understand and manage cyber-related risks for weapon systems as well as for supporting information management systems, and this during their entire lifecycle, from the cradle to the grave.</p> <p>This means that following subjects will be presented:</p> <ul style="list-style-type: none"> <li>- cyber awareness based on a number of case studies</li> <li>- data flow modelling and threat modelling</li> <li>- secure software development lifecycle</li> <li>- security controls</li> <li>- security governance and resilience</li> <li>- cyber situation awareness</li> </ul>

**Defence and Security Technology (Module E1) – EP915 Applied mechanics**

Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class
Evaluation	1 written evaluation and oral exam
Teaching content	<ol style="list-style-type: none"> <li>1. Conservation laws of mass, momentum with a focus on thrust by reaction and energy</li> <li>2. Dimensional analysis limited to force coefficients, Mach- and Reynolds-numbers</li> <li>3. Heat exchange (convection, radiation, conduction)</li> </ol>

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**Defence and Security Technology (Module E1) – EP915 Applied mechanics**

Teaching content	<ol style="list-style-type: none"> <li>4. Lift and drag forces on bodies                         <ul style="list-style-type: none"> <li>- Forces coefficients</li> <li>- Dependency on shape, angle, Ma and Re</li> <li>- Polar curves</li> </ul> </li> <li>5. Boundary layer                         <ul style="list-style-type: none"> <li>- Velocity profile</li> <li>- Laminarity/turbulence</li> <li>- Influence on force coefficients</li> <li>- Boundary layer control</li> </ul> </li> <li>6. Effect of compressibility on the forces                         <ul style="list-style-type: none"> <li>- Flow tables in compressible flows</li> <li>- Normal/oblique shock</li> <li>- Expansion</li> <li>- Wave drag</li> <li>- Flow over a supersonic wing/fin</li> </ul> </li> <li>7. Fundamentals of flow in nozzles                         <ul style="list-style-type: none"> <li>- Isentropic cases</li> <li>- Non-isentropic cases</li> </ul> </li> </ol>
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**Defence and Security Technology (Module E1) – WS913 Fired control and guided weapons**

Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class
Evaluation	1 written evaluation and oral exam
Teaching content	<p>In the first part of the course (14 Hr), the four main functions of guided weapons are described; guidance, control, propulsion and warhead. For each function, a classification and an explanation of the working principles are given. A 2DOF trajectory model is developed and examples of launch and intercept envelopes are given.</p> <p>In the second part (13 Hr), NATO trajectory modelling is applied in order to create practical Fire Control Systems. After defining general principles, different aspects such as aiming techniques and weaponeering are analysed for direct and indirect fire applications. Specific weapon systems include small arms, land, air and naval systems.</p>



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<b>Defence and Security Technology (Module E1) – SM914 Mechanics of materials and structures</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<ul style="list-style-type: none"> <li>- Material families and bonding forces</li> <li>- Fundamental aspects of cristal structure and its defects</li> <li>- Interaction between microstructure, processing and material properties</li> <li>- Determination of mechanical properties</li> <li>- Mechanical structures</li> <li>- External and internal forces on a solid structure</li> <li>- Static stress and strain determination</li> <li>- Simple and combined loading cases</li> </ul>

<b>Defence and Security Technology (Module E1) – SM921 Land vehicles propulsion, stability and performance</b>	
Credits	<b>4 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and written exam
Teaching content	<ol style="list-style-type: none"> <li>1. Vehicle design and mobility                             <ul style="list-style-type: none"> <li>- Classification of vehicles</li> <li>- Coordinate system</li> <li>- Vehicle design</li> <li>- Safety</li> <li>- Regulations</li> </ul> </li> <li>2. Prime movers for motor vehicles                             <ul style="list-style-type: none"> <li>- Internal combustion engines</li> <li>- Electric vehicles</li> <li>- Fuel Cells</li> <li>- Hybrid Vehicles</li> </ul> </li> <li>3. Propulsion                             <ul style="list-style-type: none"> <li>- Tire mechanics</li> <li>- Non driven wheel</li> <li>- Driven wheel</li> <li>- Propulsion equation of a vehicle</li> </ul> </li> <li>4. The clutch                             <ul style="list-style-type: none"> <li>- Dynamics</li> <li>- Technology</li> </ul> </li> <li>5. The gearbox                             <ul style="list-style-type: none"> <li>- Choice of a gear ratio</li> <li>- Technology of the gearbox</li> </ul> </li> </ol>

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<b>Defence and Security Technology (Module E1) – SM921 Land vehicles propulsion, stability and performance</b>	
Teaching content	<ol style="list-style-type: none"> <li>6. Propeller shaft and differential                             <ul style="list-style-type: none"> <li>- FWD</li> <li>- RWD</li> <li>- Differential</li> </ul> </li> <li>7. Steering</li> <li>8. Braking                             <ul style="list-style-type: none"> <li>- Dynamics of braking</li> <li>- Technology of the braking system</li> <li>- ABS</li> </ul> </li> <li>9. Suspension                             <ul style="list-style-type: none"> <li>- Guiding elements</li> <li>- Force elements</li> </ul> </li> </ol>

<b>Defence and Security Technology (Module E1) – SM931 Aircraft propulsion, stability and performance</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<p>This course discusses flight mechanics: the kinematics and dynamics of and around the centre of gravity of an aircraft, which is considered to be rigid. The course consists of:</p> <ol style="list-style-type: none"> <li>1. Performance (SM931a)                             <ul style="list-style-type: none"> <li>- performance in straight and level flight</li> <li>- load factor, manoeuvres in the vertical plane and gusts</li> <li>- manoeuvres in the horizontal plane</li> <li>- energy management</li> <li>- take-off and landing analysis</li> </ul> </li> <li>2. Stability (SM931a)                             <ul style="list-style-type: none"> <li>- the aerodynamic centre</li> <li>- conditions for longitudinal stability and equilibrium</li> <li>- conditions for lateral and directional stability</li> <li>- interaction between slip, roll, and yaw; stability derivatives</li> <li>- control derivatives of roll and yaw control</li> <li>- notions of dynamic stability</li> <li>- coupling with aeroelasticity</li> </ul> </li> <li>3. Propulsion (SM931b)</li> <li>4. Practical exercises</li> </ol> <p>In the practical exercise sessions, students solve problems under supervision. The selected problems are a direct application of knowledge and concepts gained in the lectures.</p>



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<b>Defence and Security Technology (Module E1) – SM941 Ship propulsion, stability and performance</b>	
Credits	<b>4 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<ol style="list-style-type: none"> <li>1. Static Stability                             <ul style="list-style-type: none"> <li>- Stability of the floating body</li> <li>- Stability of the intact ship</li> <li>- Stability computations</li> <li>- Stability curves</li> <li>- Moving, loading and unloading weights</li> <li>- The problem of mobile cargo</li> <li>- Hull damage</li> <li>- Grounding</li> </ul> </li> <li>2. Dynamic stability                             <ul style="list-style-type: none"> <li>- The influence of waves</li> <li>- Damping installations</li> </ul> </li> <li>3. Ship resistance                             <ul style="list-style-type: none"> <li>- The towing tank experiment</li> <li>- Determination of the propulsive power</li> </ul> </li> <li>4. The propulsion system                             <ul style="list-style-type: none"> <li>- The propeller</li> <li>- Alternative propulsion systems</li> <li>- Sails</li> <li>- Engine types</li> <li>- Some common configurations</li> </ul> </li> <li>5. Ship control                             <ul style="list-style-type: none"> <li>- The rudder</li> <li>- Coursekeeping</li> <li>- Rudder configurations</li> </ul> </li> </ol>

**- Studying at the Royal Military Academy**

<b>Management Studies for Defence (Module E2) - DS951 Supply chain management</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	2 written evaluations and written exam
Teaching content	This course consists of 2 main parts. In part 1 we give an overview of classical quantitative decision support tools in the domain of management science such as spreadsheet modelling, linear and integer programming, decision making under uncertainty and multicriteria decision-making. In part 2 we zoom in on supply chain management and look in more detail at specific decision support models for supply chain processes such as distribution and transportation, forecasting and inventory management.

<b>Management Studies for Defence (Module E2) – DS952 Project and program management</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class, exercises and visits
Evaluation	2 written evaluations, 1 written and oral exam
Teaching content	<p>Defence is an organization that is continuously confronted with unique and new situations. As a result, both our core and supporting activities require effective project management.</p> <p>This course builds on the basis principles of project and program management as described by the Body of Knowledge of the Project Management Institute (PMI).</p> <p>Project Management:</p> <ol style="list-style-type: none"> <li>1. Phases: initiation, planning, execution, monitoring, close out</li> <li>2. Core Knowledge areas: time, budget, scope and quality management</li> <li>3. Supporting Knowledge areas: Procurement, HR, Communication, Risk Management, Integration management</li> </ol> <p>Program and portfolio Management within the Belgian Armed Forces:</p> <ol style="list-style-type: none"> <li>1. Role of the material manager</li> <li>2. Acquisition processes and integrated logistic support</li> <li>3. Life Cycle Costing</li> </ol> <p>Practical sessions provide a profound understanding of time scheduling based on Critical Path Method and PERT.</p> <p>Students are assigned to real life projects to support the creation of an integrated project plan and the use of various templates and softwares.</p>



## - Studying at the Royal Military Academy

<b>Management Studies for Defence (Module E2)– DS953 Performance optimisation</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	2 written evaluations, 1 written and oral exam
Teaching content	<p>Knowing how to do more with less is a prerequisite for every manager within Defence. Sound decision-making is key to optimize the performance of various military services. The content of this course supports these goals in two ways:</p> <ol style="list-style-type: none"> <li>1. Overview of various modern management methods (Strategy, performance measurement, process and risk management) and change and improvement approaches (ICS, ISO 9000, Lean Six Sigma, Bottleneck Management, Change Management).</li> <li>2. Business game that illustrates the integrated character of decisions in organisations. This will illustrate how decisions are the results of both formal and informal information flows that depend on tangible (structure, strategy) and intangible (culture, team dynamics) characteristics of the organisation.</li> </ol>

<b>Security Studies for Defence (Module E3) – CS961 International conflicts in historical perspective</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation, 1 oral evaluation and oral exam
Teaching content	The core business of an officer is conducting operations, both in a national and international context. In order to assess the scope of contemporary conflicts, it is important that he is able to make a correct analysis of the conflict from a historical point of view beforehand. In this course, we will focus hereon and teach the student not only the knowledge, but also the necessary skills to help him with this. We will focus on some specific cases that are relevant for the Belgian Defence. In addition to a thorough analysis of the underlying causes of the Middle Eastern conflict, we will go deeper into the Sahel issue as well as Central Africa.

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<b>Security Studies for Defence (Module E3) – CS962 Strategic studies</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class
Evaluation	1 written evaluation, 1 oral evaluation and oral exam
Teaching content	<p>Strategy is neither simple nor easy. A good strategy requires a number of skills and competences. Professional needs to understand that formulating, articulating, evaluating or executing strategy is not an easy thing. A theory of strategy is not the simple application of a checklist or a cookbook solution that can be applied time after time. Especially in periods of great turmoil and change, the development of strategy becomes rather difficult. This course will help students to get a better understanding of the what, how and why of strategy in a fast changing world, based on the study of a number of great strategists and their approaches.</p> <p>This course provides an analysis of strategy, strategic studies and contemporary strategic issues. It will offer a critical study of war, politics and strategy. The understanding of the relationship between war and politics, strategy and security in international relations is key for junior officers. To understand the way armed forces are used nowadays and why they are deployed as well to understand the complex security environment they will need to work in. Before examining contemporary problems, we will first explore the causes of war, the evolution of modern warfare, as well as strategic theory and culture. Students will finally study the future of strategy.</p>

<b>Security Studies for Defence (Module E3) – CS963 Contemporary security issues</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma SSMW International Semester and additional participants
Type of Class	Integrated class
Evaluation	1 written evaluation, 1 oral evaluation and oral exam
Teaching content	<p>Junior officers are involved in the conduct and the execution of military operations/tasks in a national and international context. In order to prepare them for these basic functions, they should be well informed about the general framework of these operations and why Belgium makes some political choice within the framework of its foreign and defense policy.</p> <p>This course explores some of the world's most pressing and interesting political security issues that have an influence on the international environment in general and on the Belgian Security &amp; Defense Policy in particular. After a short revision of the international relations basics, cadets will first get acquainted with the Belgian foreign, security and defense policy.</p>



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### Security Studies for Defence (Module E3) – CS963 Contemporary security issues

Teaching content

In a second step, they will get information on the global risks and challenges threatening the world in general and Belgium particularly.

Finally, cadets will analyze the links between contemporary security issues and the Belgian foreign and security policy according to the Belgian Defense strategic vision 2030 that identifies our European southern periphery and our European northern and eastern flank as our major security concerns.

## ▪ Studying at the Royal Military Academy

Educational offer



- **The Polytechnic faculty**

History: When the academy was founded in 1834, the aim was to train officers and teach them how to become engineers for the «technical» branches of the time, namely artillery and military engineering. The gunner had to calculate the ballistic trajectory using different parameters like the terrain or the weather conditions, something that can be done with computers now. As for the engineering officer, he had to be able to make calculations for the construction as well as the destruction of buildings, roads or structural works.

That way of teaching has of course evolved, and has since then led to the creation of the Polytechnic Department and later the Polytechnic Faculty. Nowadays the Polytechnic Faculty grants, after a five-year-long study program, the degree of Master in Engineering Sciences.

- **Course Catalogue for the 1<sup>st</sup> and 2<sup>nd</sup> Semester of the Master 1 programme in engineering**

The master program in engineering is offered to students of the polytechnical faculty (POL). It is credited with 120 ECTS and scheduled over two consecutive academic years (each year is credited with 60 ECTS).

Besides the 120 ECTS academic courses, cadets have military and physical education.



**- Studying at the Royal Military Academy**

N°	Course code	Course title	ECTS
<b>Ma 1 POL Sem 1</b>			
1	DS415	Introduction to engineering management	3
2	EP414	Electrical power systems	6
3	LS416	Leadership	3
4	SE412	Tactical military sensors	7
5	TP413	Cabin environment of military platforms	3
6	WA411	Design principles and evaluation of armament and ammunition	8
<b>Total:</b>			<b>30</b>
<b>Ma 1 POL Sem 2</b>			
1	DS425	Intelligent decision support methods	6
2	DE422	Digital technology for sensors and weapons	5
3	SE426	Military satellite based positioning	3
4	TN423	Networks and security awareness	7
5	TP424	Ballistic impact and protection: fundamentals	3
6	WA421	Guided weapons	6
<b>Total:</b>			<b>30</b>

**- Studying at the Royal Military Academy**

- In detail:

<b>Ma 1 POL Sem 1 - DS415 Introduction to engineering management</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma 1 POL International Semester and additional participants
Type of Class	Integrated class, exercises and visit
Evaluation	2 written evaluations, 1 written and oral exam
Teaching content	<p>Major technological challenges require a structured management approach. Therefore, this course provides an overview of the main Engineering Management domains and demonstrates their relevance for Defense. Further, the course clarifies how activities with a technological aspect are to be managed in compliance with the Internal Control System (ICS) guidelines of Defense, following the basic principles of Project Management and Risk Management. This implies the study of the leading Project Management methodologies (Project Management Institute and PRINCE II) and engineering management standards (Engineering Management Body of Knowledge EMBOK), as well as a critical analysis of Program Management and Life Cycle Costing for major military procurement projects.</p> <p>Contents:</p> <ul style="list-style-type: none"> <li>- Definition of engineering management - importance for defense</li> <li>- Engineering Management principles: the Engineering Management Body of Knowledge</li> <li>- Project Management Methodology: PMI and PRINCE II</li> <li>- Case study:                             <ul style="list-style-type: none"> <li>• A400M: Program management and Life Cycle Costing</li> <li>• Certification of laboratories based on ISO 17025</li> </ul> </li> </ul>

<b>Ma 1 POL Sem 1 - EP414 Electrical power systems</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma 1 POL International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	2 oral evaluations, 1 written and oral exam
Teaching content	<p>1. Basic Laws</p> <ul style="list-style-type: none"> <li>- Circuit laws</li> <li>- Faraday, Laplace, Maxwell-Ampère</li> <li>- Active and reactive power, power balance, power factor</li> <li>- Phasors</li> </ul>



**- Studying at the Royal Military Academy**

**Ma 1 POL Sem 1 - EP414 Electrical power systems**

Teaching content	<p>2. General overview of electrical power systems</p> <ul style="list-style-type: none"> <li>- Introduction: some numbers about electricity production</li> <li>- General power system properties</li> <li>- Electric power generation : Thermal power plants</li> <li>- Nuclear physics in electric power generation : Nuclear power plants</li> <li>- Renewable electricity production (hydropower - wind - solar)</li> <li>- Energy storage.</li> </ul> <p>3. Electric safety</p> <ul style="list-style-type: none"> <li>- Earthing</li> <li>- Hazards</li> <li>- Switching devices</li> <li>- Over-current protection</li> <li>- Protection against leakage currents</li> </ul> <p>4. Electrical power systems components</p> <ul style="list-style-type: none"> <li>- Transformers</li> <li>- Three phase networks</li> <li>- General overview of electrical machines (DC, induction, synchronous)</li> <li>- Synchronous machines (alternator, motor)</li> </ul> <p>5. Topical subjects presented in flipped classroom (electricity grid load - generation - interconnections - trading, modern electric motors and actuators, electric and more-electric ships, aircrafts and ground vehicles, ...)</p>
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**Ma 1 POL Sem 1 - LS416 Leadership**

Credits	<b>3 ECTS</b>
To be covered in	Ma 1 POL International Semester and additional participants
Type of Class	Integrated class, exercises and visit
Evaluation	1 written evaluation and oral exam
Teaching content	The course develops the academic basis relative to different leadership aspects. It focuses on the personality of the leader (BE, KNOW, DO), the situation (mainly how a group works) and the mutual influences. These aspects are developed through interactive classes.

**- Studying at the Royal Military Academy**

**Ma 1 POL Sem 1 - SE412 Tactical military sensors**

Credits	<b>7 ECTS</b>
To be covered in	Ma 1 POL International Semester and additional participants
Type of Class	Integrated class, exercises and visit
Evaluation	1 written evaluation, 1 oral evaluation and 1 oral exam with written part
Teaching content	This course starts with a general introduction on military remote sensing. Based on the spectral domain where the sensors are operating they will be subdivided in electro-optical/infrared (EO/IR) sensors and radar systems. This subdivision is the basis for the general structure of the course which will consist of 3 parts: (1) passive EO/IR sensors, (2) active EO/IR sensors, (3) radar. For each part, the information is structured in the same way. First the relevant phenomenology is described, explaining the proper emission of the sources and targets, their reflection properties, and the transmission behaviour of the atmosphere. Then the description of the sensor itself follows including hardware, signal/image processing and measurement principles. Combining all that information leads to an understanding of the sensor performance and limitations, and how countermeasures could work. Directed Energy Weapons are also discussed here. A wrap-up is foreseen for each part and each sensor, describing military applications and future trends.

**Ma 1 POL Sem 1 - TP413 Cabin environment of military platforms**

Credits	<b>3 ECTS</b>
To be covered in	Ma 1 POL International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 oral evaluation and 1 oral exam with written part
Teaching content	<ol style="list-style-type: none"> <li>1. Comfort requirements</li> <li>2. Thermodynamics of moist air</li> <li>3. Heat transfer</li> <li>4. Cabin energy balance</li> <li>5. Ventilation</li> <li>6. Air quality and filtration</li> </ol>



**- Studying at the Royal Military Academy**

<b>Ma 1 POL Sem 1 - WA411 Design principles and evaluation of armament and ammunition</b>	
Credits	<b>8 ECTS</b>
To be covered in	Ma 1 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class, exercises and visit
Evaluation	1 written evaluation, oral evaluation and oral exam
Teaching content	<p>The course WA411 limits itself to the classical gun systems, i.e. excluding rockets, missiles and electrical systems. It covers small, medium and large calibre gun systems, next to kinetic energy non-lethal weapons.</p> <p>The level of ambition of this course is not aimed at the development of new weapon systems but more at acquiring the skills to follow-up weapon system projects and evaluate their feasibility from a technical point of view. Based on first principle approaches this course will provide the necessary tools to validate weapon systems projects and/or concepts. A number of weapon system concepts will be investigated in more detail both by desktop calculations and laboratory sessions in the Laboratory of the Department ABAL. The course will be concluded by a one-day visit to the relevant Belgian industry.</p>

<b>Ma 1 POL Sem 2 - DS425 Intelligent decision support methods</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma 1 POL Sem 2 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	2 written evaluations and oral exam
Teaching content	<ol style="list-style-type: none"> <li>1. Foundations of Artificial Intelligence</li> <li>2. Problem solving by searching</li> <li>3. Constraint satisfaction problems</li> <li>4. Games and adversarial search</li> <li>5. Knowledge representation</li> <li>6. Probabilistic reasoning</li> <li>7. Making decisions</li> <li>8. Learning</li> </ol>

**- Studying at the Royal Military Academy**

<b>Ma 1 POL Sem 2 - DE422 Digital technology for sensors and weapons</b>	
Credits	<b>5 ECTS</b>
To be covered in	Ma 1 POL Sem 2 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and written exam
Teaching content	<p>The course material will cover:</p> <ul style="list-style-type: none"> <li>- Integrated circuit technology (CMOS/BJT/BiCMOS)</li> <li>- Transistor modelling</li> <li>- Current and voltage reference circuits</li> <li>- Basic building blocks (amplifiers, buffers, differential amplifier)</li> <li>- Comparator Design</li> <li>- OPAMP Design (Miller OPAMP)</li> <li>- Stabilization techniques</li> <li>- Noise in electronic circuits</li> <li>- Sensor integration</li> <li>- Integrated sensor types</li> <li>- Sensor characteristics</li> <li>- Sensor interfacing</li> <li>- MEMS integration</li> <li>- Read-out circuit design</li> <li>- Readout modes</li> <li>- Offset cancelation techniques</li> <li>- Chopper stabilization and Lock-in techniques</li> <li>- Optical camera design and implications</li> <li>- Camera chips and applications</li> </ul>

<b>Ma 1 POL Sem 2 - SE426 Military satellite based positioning</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma 1 POL Sem 2 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 oral evaluation and oral exam
Teaching content	<ul style="list-style-type: none"> <li>- Satellite geodesy made easy</li> <li>- Principles of measuring signal time transit</li> <li>- Effects of errors on measuring signal time transit</li> <li>- Brief review of satellite geodesy</li> <li>- Ellipsoidal geodetic and cartesian coordinates</li> <li>- Atomic time scales</li> <li>- Kepler laws of satellite motion</li> <li>- The legacy Global Positioning System</li> <li>- Segments of the legacy GPS</li> <li>- Legacy navigation services</li> <li>- The legacy ranging codes</li> </ul>



**- Studying at the Royal Military Academy**

Ma 1 POL Sem 2 - SE426 Military satellite based positioning	
Teaching content	<ul style="list-style-type: none"> <li>- The legacy navigation message</li> <li>- Generation and transmission of the legacy GPS signals</li> <li>- The European Galileo system</li> <li>- Segments of the Galileo system</li> <li>- Modernised GNSS signals</li> <li>- Generation and transmission of the modernised GNSS signals</li> <li>- The navigation messages</li> <li>- Navigation services</li> <li>- Overview of modern GNSS systems</li> <li>- The modernised GPS system</li> <li>- BEIDOU, the Chinese GNSS</li> <li>- Glonass, the Russian GNSS</li> <li>- Solving the navigation problem</li> <li>- Single point PNT calculation</li> <li>- Error sources analysis</li> <li>- Dilution of Precision</li> <li>- Augmentation systems</li> <li>- Differential GNSS navigation</li> <li>- Wide Area differential GNSS</li> <li>- Ground and Satellite Based Augmentation Systems</li> <li>- Assisted GNSS</li> <li>- Open source GNSS processing</li> <li>- NMEA - National Marine Electronic Association</li> <li>- DGNS correction data</li> <li>- RTKLib - An Open Source Program Package for GNSS Positioning</li> <li>- gfrnx - RINEX GNSS Data Conversion and Manipulation Toolbox</li> </ul>

Ma 1 POL Sem 2 - TN423 Networks and security awareness	
Credits	<b>7 ECTS</b>
To be covered in	Ma 1 POL Sem 2 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation, 1 oral evaluation and oral exam
Teaching content	<p>This course is divided into two parts. In a first part, we will introduce the architecture, technology, protocols and applications used in data networks.</p> <p>In this part, the following topics are covered:</p> <ul style="list-style-type: none"> <li>- Layered architecture of data networks</li> <li>- LAN protocols</li> <li>- Internet Protocol</li> <li>- IP routing protocols</li> <li>- Transport protocols</li> <li>- Hand-on lab sessions on switching, IP and IP routing</li> </ul>

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Ma 1 POL Sem 2 - TN423 Networks and security awareness	
Teaching content	<p>The second part will be focusing on security awareness. It will cover:</p> <ul style="list-style-type: none"> <li>- Theoretical basis on cryptography.</li> <li>- Security of the individual computer,</li> <li>- Types of threat sources,</li> <li>- Public sources of information for hackers,</li> <li>- Social engineering,</li> <li>- Remote attacks over a network,</li> <li>- Vulnerabilities in a computer network (layers 1-4),</li> <li>- Vulnerabilities at the level of the application layer,</li> <li>- Buffer overruns in software,</li> <li>- Access control, authentication and authorization,</li> <li>- Secure programming,</li> <li>- Network security (layers 1-7),</li> <li>- Network encryption, IPSEC and SSL</li> <li>- Intrusion detection systems (IDS) and honeypots</li> <li>- Risk management</li> </ul>

Ma 1 POL Sem 2 - TP424 Ballistic impact and protection: fundamentals	
Credits	<b>3 ECTS</b>
To be covered in	Ma 1 POL Sem 2 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<p>The course TP424 addresses the field of terminal ballistics from both a practical and a theoretical point of view. This includes an overview of the different ballistic threats present on the modern battlefield, modelling approaches to evaluate the effects of these threats, next to introducing basic protective schemes based on the aforementioned models.</p> <p>The level of ambition of this course is not aimed at the development of new ballistic protection systems but more at acquiring the skills to evaluate the feasibility of ballistic protection concepts from a technical point of view.</p> <p>Based on 'first principle' approaches this course will provide the necessary tools to validate ballistic protection concepts. A number of modelling approaches in this field will be investigated in more detail both by desktop calculations and/or simulations using finite element software.</p>



**- Studying at the Royal Military Academy**

<b>Ma 1 POL Sem 2 - WA421 Guided weapons</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma 1 POL Sem 2 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	2 written evaluations and oral exam
Teaching content	<p>In the first part of the course (2 ECTS, 9 Hr theory, 12 Hr practical work) different aspects of rocket propulsion are discussed: basic performance, thermodynamic calculations of rocket performances, chemistry of rocket propellants, design of a rocket propulsion system and experimental testing of rocket propellants. Chemical hybrid propulsion will also be discussed.</p> <p>In the second part of the course (4 ECTS, 26 Hr theory, 15 Hr practical work), the four main components of a guided weapon are discussed: guidance, control, propulsion and warhead. The emphasis is on guidance and control, where mathematical models are developed. The trajectory models (2DOF to 6DOF models), combined with the guidance models, lead to launch and intercept envelopes and the definition of avoidance techniques. The chapter on guidance methods presents technical solutions for guidance problems, based on available sensors and guidance laws. In the chapter on control methods, the technical solutions for the control problem are compared. The chapters on propulsion and warhead are limited to comments on the selection of engines and warhead as a function of the requirements.</p>

**- Studying at the Royal Military Academy**

- Course Catalogue for the 1<sup>st</sup> Semester of the Master 2 programme in engineering

**POL Master 2 Semester 1:**

- Module C1 (30 ECTS)
- Module C2 (24 ECTS) + Module D1 or Module D2 or Module D3 (06 ECTS).

N°	Course code	Course title	ECTS
<b>Ma 2 POL (Module C1) - Network enabled capabilities</b>			
C11	SE511	Strategic military sensors	6
C12	TN512	Distributed information systems	6
C13	TN513	Information networks	6
C14	TN514	Advanced wireless communication systems	6
C15	TN515	Communication subsystems	6
<b>Total:</b>			<b>30</b>

<b>Ma 2 POL (Module C2) - Structure, mobility and propulsion</b>			
C21	EP522	Turbomachines	3
C22	SM524	Numerical and experimental methods applied to continuum mechanics	6
C23	SM525	Ageing of systems	3
C24	SM526	Mechanical systems integration	3
C25	SM527	Autonomous systems	3
C26	TP521	Ballistic impact and protection: applications	3
C27	TP523	Effects of explosions on structures	3
<b>Total</b>			<b>24</b>

**Students who have chosen the C2 module take one D module (6 ECTS).**

<b>Ma 2 POL (Module D1)</b>			
D11	SM531	Land vehicle performance and stability	6
<b>Total</b>			<b>6</b>

<b>Ma 2 POL (Module D2)</b>			
D21	SM541	Performance and stability of fixed wing aircraft	4
D22	SM542	Air vehicle technology	2
<b>Total</b>			<b>6</b>

<b>Ma 2 POL (Module D3)</b>			
D31	SM551	Ship stability and performance	6
<b>Total</b>			<b>6</b>



**- Studying at the Royal Military Academy**

- In detail:

<b>Ma 2 POL (Module C1) - Network enabled capabilities – SE511 Strategic military sensors</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	Sensing platforms ( UGV, UAS, airborne/spaceborne imaging) Sensors & their specificities (EO/IR, hyperspectral imaging, range-based imaging (lidar, radar), sonar imaging. MIMO/Bistatic/Multistatic radar/sonar). Advanced signal processing (Moving target Indication, Syntetic Aperture Radar, Space-Time Adaptive Processing). Image post-processing, multisensor data fusion; Distributed Geographical Information Systems.

<b>Ma 2 POL (Module C1) - Network enabled capabilities – TN512 Distributed information systems</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	The course on distributed information systems covers the broad range of architectures and technologies that allow us to build current day information systems. This ranges from the “old” application layer protocols over middlewares to highly distributed solutions as in sensor networks or the Internet of Things. We also cover different approaches for storing and managing information (SQL, no-SQL, ...), as well as information retrieval. Finally we also discuss specific requirements like high availability and high performance computing, as well as virtualisation, and cloud technologies.

**- Studying at the Royal Military Academy**

<b>Ma 2 POL (Module C1) - Network enabled capabilities – TN513 Information networks</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class, exercises and visit
Evaluation	1 written evaluation, 1 oral evaluation and oral exam
Teaching content	This course first takes a closer look at advanced technologies, operation and application of data networks including wireless Ad Hoc technologies, IPv6, connection oriented backbone networks and access networks.  The following topics are covered in this part: <ul style="list-style-type: none"> <li>- Internet Protocol version 6</li> <li>- Wireless access protocols</li> <li>- Ad Hoc routing protocols</li> <li>- Software Defined Networking</li> <li>- Connection oriented protocols (e.g. MPLS, Carrier Ethernet) for wide area networks</li> <li>- Performance analysis of data networks</li> <li>- Lab sessions on IPv6 routing, WLAN and connection oriented protocols</li> </ul> In the second part of the course the students learn to perform forensics, both system and network forensics. The following topic are covered in this part: <ul style="list-style-type: none"> <li>- Windows system forensics (disk and removable devices)</li> <li>- Linux and Windows Memory forensics</li> <li>- Network forensics</li> </ul> At the end the students solve a case where they look at network and system traces to analyse a security incident that happened on the network.

<b>Ma 2 POL (Module C1) - Network enabled capabilities – TN514 Advanced wireless communication systems</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class, exercises and visits
Evaluation	1 written evaluation, 1 oral evaluation and oral exam
Teaching content	The course gives an overview of the theory and practice behind many of today’s communications systems in the domain of source coding and channel coding. The course introduces the architecture and technology of telecommunication systems at a block diagram level with an accent on radio transmitters/receivers, satellite communications and wireless communication networks.



**- Studying at the Royal Military Academy**

**Ma 2 POL (Module C1) - Network enabled capabilities – TN514 Advanced wireless communication systems**

Teaching content	<p>The following topics are covered:</p> <ul style="list-style-type: none"> <li>- Introduction to Information Theory.</li> <li>- Source coding, including Vocoders.</li> <li>- Forward Error Coding: linear codes, cyclic codes (BCH, RS), convolutional codes, turbo codes, LDPC codes.</li> <li>- Software Defined Radio (SDR) technology.</li> <li>- Noise performance and linearity of radio transmitter and receiver.</li> <li>- Digital modulation schemes, including Spread spectrum techniques and Orthogonal Frequency Division Multiplexing (OFDM).</li> <li>- Optimal digital receivers for band limited signals in an AWGN channel.</li> <li>- Carrier and symbol synchronisation.</li> <li>- Multiple-Input Multiple-Output techniques.</li> <li>- Satellite communication systems.</li> <li>- Wireless cellular communication systems.</li> </ul>
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**Ma 2 POL (Module C1) - Network enabled capabilities – TN515 Communication subsystems**

Credits	<b>6 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	2 written evaluations and oral exam
Teaching content	<p>The course gives an overview of the theory and practice of the three key subsystems of today's communication systems, namely the transmission line, the antenna and the propagation channel.</p> <p>For each of the subsystems the course introduces the principle of operation, defines the parameters characterizing its functioning and performances with special attention to their respective advantages and drawbacks in definite applications, in particular those related to defence and security.</p> <p>The following topics are covered :</p> <ul style="list-style-type: none"> <li>- General theory of transmission line</li> <li>- Conductive transmission lines</li> <li>- Dielectric transmission lines</li> <li>- Radiation from elementary sources</li> <li>- Transmitting antenna</li> <li>- Receiving antenna</li> <li>- General equation of a radiolink</li> <li>- Aperture antennas</li> <li>- Array antennas</li> <li>- Propagation modes of a radiowave</li> <li>- Condition of possibility of the radiolink</li> <li>- Influence of the atmosphere</li> </ul>

**- Studying at the Royal Military Academy**

**Ma 2 POL (Module C2) - Structure, mobility and propulsion – EP522 Turbomachines**

Credits	<b>3 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<ul style="list-style-type: none"> <li>- Fundamental equations for turbomachines</li> <li>- Centrifugal turbopumps</li> <li>- Axial and radial turbines</li> <li>- Axial and radial compressors</li> </ul>

**Ma 2 POL (Module C2) - Structure, mobility and propulsion – SM524 Numerical and experimental methods applied to continuum mechanics**

Credits	<b>6 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class
Evaluation	2 written evaluations and oral exam
Teaching content	<p>This course will consist of one combined numerical-experimental project in one of the following domains:</p> <ul style="list-style-type: none"> <li>- dynamic structural behaviour</li> <li>- fluid mechanics</li> <li>- vibrations</li> </ul> <p>The students will</p> <ul style="list-style-type: none"> <li>- build an experimental setup</li> <li>- instrument the experimental setup using relevant measurement systems to measure e.g. pressure, displacement, strain, velocity and/or accelerations</li> <li>- measure, analyze and evaluate the relevant measured variables</li> <li>- build a numerical model of the setup</li> <li>- simulate the model behavior given the experimental initial and boundary conditions</li> <li>- analyze and evaluate the relevant calculated variables</li> <li>- compare and discuss the numerical and experimental output</li> <li>- write a report describing the:             <ul style="list-style-type: none"> <li>- setup</li> <li>- used measurement systems</li> <li>- measurements</li> <li>- numerical model</li> <li>- simulation results</li> <li>- comparison between measured and simulated results</li> </ul> </li> </ul>



**- Studying at the Royal Military Academy**

<b>Ma 2 POL (Module C2) - Structure, mobility and propulsion – SM525 Ageing of systems</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<p>Introduction to failure analysis of components                      Overview of the different material degradation mechanisms                      Elements of Fracture Mechanics                      Single load fractures (shear and cleavage mode)                      Residual stresses                      Brittle fracture                      Ductile fracture                      Fatigue fracture                      Wear failure                      Corrosion failures                      High temperature failure</p> <p>Fractography                      Introduction to nondestructive testing including:                      - liquid penetrant testing                      - magnetic particle inspection                      - radiography                      - Eddy currents                      - ultrasonic inspection                      - acoustic emission                      Methodology for conducting a practical failure analysis</p>

<b>Ma 2 POL (Module C2) - Structure, mobility and propulsion – SM526 Mechanical systems integration</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class, exercises and visits
Evaluation	1 written evaluation and oral exam
Teaching content	<p>In this course several (classical) production techniques (turning, milling, drilling, grinding,...) and assembly techniques (glues, welding, bolt-screws,...) are described. Special attention is given to standardization in this field and to the design of bearings.</p> <p>Modern machining techniques are mentioned for information.</p> <p>Table of contents:                      - General information on mechanical design                      - Tolerances, fits and surface quality</p>

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<b>Ma 2 POL (Module C2) - Structure, mobility and propulsion – SM526 Mechanical systems integration</b>	
Teaching content	<ul style="list-style-type: none"> <li>- Machining Basics</li> <li>- The shooting</li> <li>- Milling</li> <li>- Drilling and grinding</li> <li>- Assembly techniques</li> <li>- Operation and lubrication of the bearings</li> </ul>

<b>Ma 2 POL (Module C2) - Structure, mobility and propulsion – SM527 Autonomous systems</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<p>At the end of the course, students are expected to have demonstrable knowledge and insight in the following aspects of unmanned and remotely piloted platforms (land/air/sea):</p> <ol style="list-style-type: none"> <li>1. Kinematics and actuation of platforms,</li> <li>2. Perception of the environment, obstacle avoidance and motion planning,</li> <li>3. Control of individual and of group of platforms,</li> <li>4. Applications of autonomous systems,</li> <li>6. 5. Safety and regulation</li> </ol>

<b>Ma 2 POL (Module C2) - Structure, mobility and propulsion – TP521 Ballistic impact and protection: applications</b>	
Credits	<b>3 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and oral exam
Teaching content	<p>The course TP521 is a continuation of the concepts taught in the course TP424, applying and extending the content of the latter to applications specifically for the land battle. The course will include state-of-the-art concepts and methods for the design and evaluation of vehicle armour systems and personal armour systems (body armour). The importance of ballistic protection as part of a complete system will also be illustrated using the 'survivability onion' concept, and by illustrating trade-offs that can be made linked to ballistic protection (reactive armour, active armour, threat detection, damage mitigation).</p>



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#### Ma 2 POL (Module C2) - Structure, mobility and propulsion – TP521 Ballistic impact and protection: applications

Teaching content	<p>Due to the shift in threat scenario as encountered in current operations, an important part of the course will also be devoted to the effects of blast loadings on both vehicle and personal armour systems, and how these systems are designed in order to mitigate both ballistic and blast effects.</p> <p>The level of ambition of this course is not aimed at the development of new ballistic protection systems but more at acquiring the skills to evaluate the feasibility of ballistic protection concepts from a technical point of view.</p> <p>Based on 'first principle' approaches this course will provide the necessary tools to validate ballistic protection concepts. A number of modelling approaches in this field will be investigated in more detail both by desktop calculations and/or simulations using finite element software.</p>
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#### Ma 2 POL (Module C2) - Structure, mobility and propulsion – TP523 Effects of explosions on structures

Credits	<b>3 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and written exam
Teaching content	<p>General classification of explosions</p> <p>Shock wave characterisation for non-confined explosions</p> <p>Study of shock wave propagation and reflection</p> <p>Use of scaling laws for model evaluation</p> <p>Blast loading of structures</p> <p>Dynamic behaviour of construction materials</p> <p>Resistance function for steel and reinforced concrete beams and columns</p> <p>Single degree of freedom modeling</p> <p>Blast load calculation of structures based on Technical Manual UFC 3-340-02</p>

#### Ma 2 POL (Module D1)– SM531 Land vehicle performance and stability

Credits	<b>6 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	2 written evaluations, 1 oral and written exam
Teaching content	<ol style="list-style-type: none"> <li>1. Vehicle design and mobility <ul style="list-style-type: none"> <li>- classification, mobility requirements, safety, vehicle design</li> </ul> </li> <li>2. Mechanics of tires <ul style="list-style-type: none"> <li>- Tire terminology</li> <li>- Rim characteristics</li> </ul> </li> </ol>

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#### Ma 2 POL (Module D1)– SM531 Land vehicle performance and stability

Teaching content	<ul style="list-style-type: none"> <li>- Tire characteristics</li> <li>- On-road longitudinal tire dynamics</li> <li>- Off-road longitudinal tire dynamics</li> <li>- Lateral tire dynamics</li> <li>- Interaction between longitudinal and lateral forces</li> <li>- Vertical properties of tires</li> </ul> <ol style="list-style-type: none"> <li>3. Propulsion <ul style="list-style-type: none"> <li>- On road vehicle propulsion</li> <li>- Off road vehicle propulsion</li> <li>- Prime movers</li> <li>- Power transmission (gearbox, differential, ASR)</li> </ul> </li> <li>4. Braking <ul style="list-style-type: none"> <li>- Braking performance</li> <li>- Braking stability</li> <li>- Brake proportioning</li> <li>- ABS, EBD, ...</li> </ul> </li> <li>5. Suspensions <ul style="list-style-type: none"> <li>- Linkages</li> <li>- Force elements</li> <li>- Bounce and pitch motion</li> <li>- Vehicle roll</li> </ul> </li> <li>6. Vehicle handling <ul style="list-style-type: none"> <li>- Low speed maneuverability</li> <li>- High speed maneuverability</li> <li>- ESC</li> </ul> </li> <li>7. Practical sessions</li> </ol> <p>In the practical exercise session students solve problems (under supervision). The selected problems are an application of the knowledge and concepts gained in the lectures.</p>
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#### Ma 2 POL (Module D2)– SM541 Performance and stability of fixed wing aircraft

Credits	<b>4 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class and exercises
Evaluation	1 written evaluation and written exam
Teaching content	<p>Aircraft Performance:</p> <ul style="list-style-type: none"> <li>- Performance parameters: Coventions, Forces, Fundamental parameters, Governing equations</li> <li>- Steady flight: Symmetric flight, Parameters affecting performance curves, Climbing performance, Descending performance</li> <li>- Accelerated flight: Accelerated straight level flight, Load factor, Turning flight, Accelerated climbs, Total energy, Flight envelope, Takeoff, Landing</li> <li>- Aircraft Stability:</li> <li>- Static stability and control</li> </ul>



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<b>Ma 2 POL (Module D2)– SM541 Performance and stability of fixed wing aircraft</b>	
Teaching content	<ul style="list-style-type: none"> <li>- Equations of motion</li> <li>- Stability derivatives</li> <li>- Dynamic stability</li> <li>- Control response</li> <li>- Introduction to enhanced stability</li> </ul>

<b>Ma 2 POL (Module D2)– SM542 Air vehicle technology</b>	
Credits	<b>2 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class, exercises and visits
Evaluation	1 written evaluation and oral exam
Teaching content	<ol style="list-style-type: none"> <li>1. Wings, high-lift devices, and control surfaces,</li> <li>2. Aeroelasticity (wing divergence and aileron reversal),</li> <li>3. Fuselage aerodynamics and structure,</li> <li>4. Fan/Propeller/Rotor aerodynamics and structure,</li> <li>5. On-board systems (ECS, APU/EPU, hydraulic system, electric system, fuel system,...),</li> <li>6. Supersonic flight.</li> </ol>

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<b>Ma 2 POL (Module D3)– SM551 Ship stability and performance</b>	
Credits	<b>6 ECTS</b>
To be covered in	Ma 2 POL Sem 1 International Semester and additional participants
Type of Class	Integrated class, exercises and visits
Evaluation	1 oral evaluation and oral exam
Teaching content	<ol style="list-style-type: none"> <li>1. Static Stability                             <ul style="list-style-type: none"> <li>- Stability of the floating body</li> <li>- Stability of the intact ship</li> <li>- Stability computations</li> <li>- Stability curves</li> <li>- Moving, loading and unloading weights</li> <li>- The problem of mobile cargo</li> <li>- Hull damage</li> <li>- Grounding</li> <li>- Docking</li> <li>- The inclining experiment</li> <li>- Stability regulations</li> </ul> </li> <li>2. Dynamic stability                             <ul style="list-style-type: none"> <li>- Modeling waves</li> <li>- Ship motions</li> <li>- Damping installations</li> <li>- Seakeeping experiments</li> </ul> </li> <li>3. Ship resistance                             <ul style="list-style-type: none"> <li>- The towing tank experiment</li> <li>- Numerical approximation</li> </ul> </li> </ol>



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### Grading system

Students at the RMA are graded according to the table underneath and the following rules:

Course unit code (1)	Title of course unit	Duration of course unit (2)	Local grade (3)	Local grade (4)	Local grade (5)
Example					
CS962	Strategic studies	15	14	B	6

#### Course unit code:

Refer to the ECTS information package

#### Duration of course unit:

Y	=	1 full academic year
1S	=	1 semester
1T	=	term/trimester
2S	=	2 semesters
2T	=	2 terms / trimest

#### Description of the institutional grading system:

Individual grades are reported to the students on a scale ranging from 0 to 20. ECTS credits for a given course are awarded if a student gets a grade of 10 out of 20 (or higher). For students who pass the examinations, the grades have the following meaning: 10 or 11: pass; 12 or 13: satisfactory; 14 or 15: good; 16 or 17: very good; and 18 or more: excellent.

#### ECTS grading scale:

ECTS grade	% of successful students normally achieving the grade	Definition
A	10	EXCELLENT – outstanding performance with only minor errors
B	25	VERY GOOD – above the average standard but with some errors
C	30	GOOD – generally sound work with a number of notable errors
D	25	SATISFACTORY – fair but with significant shortcomings
E	10	SUFFICIENT – performance meets the minimum criteria
FX	-	FAIL – some more required before the credit can be awarded
F	-	FAIL – considerable further work is required

#### ECTS credits:

1 full academic year	=	60 credits
1 semester	=	30 credits
1 term / trimester	=	20 credits

## ▀ Studying at the Royal Military Academy

### Getting to Brussels and the RMA:

#### Address

#### Postal address of Campus Renaissance:

Avenue Renaissance 30  
1000 Brussels

#### Entry of Campus Renaissance:

Rue Hobbema 8  
1000 Brussels

#### Guardhouse phone



+ 32(0)2 4413867

#### Nearby subway stations

Two subway stations at approximately 10 to 15 minutes walking distance from the RMA: Schuman and Merode.

#### Parking

Please take into account the difficulty of parking in the neighbourhood of the RMA and the number of limited parking spaces within the RMA. We would like to encourage you to join the RMA by public transport.

#### Location

The RMA is situated next to the Parc du Cinquantenaire and close to the European Institutions (place Schuman).

#### More informations about the city of Brussels, public transport or hotels ?

#### Please visit the following websites:

<https://visit.brussels/en>  
<https://be.brussels/>  
<https://www.brusselsofbrussels.be/en>  
<https://inforjeunesbruxelles.be/>  
<https://www.stib-mivb.be/?l=en>  
<https://www.belgiantrain.be/en>  
<https://www.hotelscombined.be/>



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