माध्यमिक शिक्षा पाठ्यक्रम, २०७६
(कक्षा ११ र १२)

भाग १ : अनिवार्य विषय
भाग २ : ऐच्छिक पहिलो समूह
भाग ३ : ऐच्छिक दोस्रो समूह
भाग ४ : ऐच्छिक तेस्रो समूह
भाग ५ : ऐच्छिक चौथो समूह

नेपाल सरकार
शिक्षा, विज्ञान तथा प्रविधि मन्त्रालय
पाठ्यक्रम विकास केन्द्र
सानोठिमी, भक्तपुर

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भाग २

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कक्षा ११ र १२

भाग २
(ऐच्छिक विषय, चौथो समूह)

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(कक्षा ११ र १२)

भाग २

(ऐच्छिक विषय, चौथो समूह)

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प्रकाशक : नेपाल सरकार
शिक्षा, विज्ञान तथा प्रविधि मन्त्रालय
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सानोठिमी, भक्तपुर

वि.सं. २०७६

मुद्रण :

प्राक्कथन

पाठ्यक्रम सिकाइ शिक्षणको मूल आधार हो । पाठ्यक्रममा समावेश हुने विषयवस्तु र तिनको अभ्यासको स्तरले शिक्षाको समग्र गुणस्तरलाई प्रभाव पार्दछ । पाठ्यक्रमले प्रत्येक व्यक्तिमा अन्तर्निहित प्रतिभा प्रस्फुटन गराई व्यक्तित्व विकास गर्न सक्नुपर्छ । यसै गरी राष्ट्र र राष्ट्रियताप्रति निष्ठावान्, स्वाभिमानी, नैतिकवान्, जिम्मेवार, श्रमलाई सम्मान गर्ने, उद्यमशील र सिपयुक्त नागरिक विकासमा पाठ्यक्रमले सहयोग गर्नु पर्दछ । पाठ्यक्रम कार्यान्वयनपछि उत्पादित जनशक्तिले सामाजिकीकरणमा सहयोग गर्नुका साथै राष्ट्रिय एकता सुदृढ गर्दै राष्ट्रिय सम्पदा र पर्यावरणको संरक्षण गर्न सक्नुपर्छ । यस पाठ्यक्रमबाट विद्यार्थीमा शान्ति, समानता तथा सामाजिक न्यायप्रति प्रतिबद्ध भई सहिष्णुता तथा सदाचार जस्ता आचरण विकासमा सहयोग पुग्ने अपेक्षा गरिएको छ । यसबाट सूचना प्रविधिको प्रयोग, वैज्ञानिक अवधारणाको आत्मसात्, खोज तथा अनुसन्धान क्षमताको विकास र जीवनोपयोगी सिप प्राप्तिका माध्यमले प्रतिस्पर्धात्मक क्षमतायुक्त जनशक्ति तयार गर्नुका साथै आफ्नो भाषा, संस्कृति, कलाप्रतिको अनुरागसहितको पहिचानमा गौरवको अनुभूति गर्ने नागरिक विकासमा योगदान हुने अपेक्षा गरिएको छ । यी पक्षहरूलाई दृष्टिगत गर्दै राष्ट्रिय पाठ्यक्रम प्रारूप, २०७६ को मार्गनिर्देशअनुसार कक्षा ११ र १२ का लागि यो पाठ्यक्रम विकास गरिएको हो ।

पाठ्यक्रम विकास प्रक्रियामा सम्बद्ध विभिन्न सरोकारवालाहरूको सहभागिता जुटाइएको थियो । माध्यमिक तह (कक्षा ११-१२) का विभिन्न विषयका पाठ्यक्रम विकास प्रक्रियामा सहभागी शिक्षाविद्, प्राध्यापक, शिक्षक, विद्यार्थी, अभिभावक तथा शिक्षासम्बद्ध सङ्घसंस्था र सरोकारावालाहरू, पाठ्यक्रम मस्यौदा कार्यदल तथा सम्बन्धित विषय समितिका सदस्यहरूलगायतका सुझावलाई समेटी यो पाठ्यक्रम तयार गरिएको छ । पाठ्यक्रममा विद्यार्थीका सक्षमता, अपेक्षित सिकाइ उपलब्धि, विषयवस्तुको क्षेत्र तथा क्रम, सिकाइ सहजीकरण प्रक्रिया र सिकाइ उपलब्धि आकलन प्रक्रिया समावेश गरिएको छ । यस कार्यमा पाठ्यक्रम मस्यौदा कार्यदल तथा सम्बन्धित विषय समितिका सदस्यहरूलगायत उल्लिखित सरोकारवालाहरू तथा पाठ्यक्रम विकास केन्द्रका सम्बन्धित कर्मचारी योगदान रहेको छ । पाठ्यक्रम विकासमा आवश्यक नीतिगत मार्गदर्शन प्रदान गर्नुका साथै पाठ्यक्रमलाई अन्तिम रूप दिने कार्यमा राष्ट्रिय पाठ्यक्रम विकास तथा मूल्याङ्कनबाट गठित विभिन्न प्राविधिक समितिहरूको भूमिका महत्त्वपूर्ण रहेको छ । पाठ्यक्रम विकास केन्द्र पाठ्यक्रम विकासमा योगदान गर्ने सबैप्रति कृतज्ञता प्रकट गर्दछ ।

यो पाठ्यक्रमको प्रभावकारी कार्यान्वयनका लागि सम्बद्ध सबै पक्षको योगदान अपेक्षित छ । पाठ्यक्रम सुधारको कार्य निरन्तर चल्ने प्रक्रिया भएकाले भविष्यमा यसलाई अझ प्रभावकारी बनाउन शिक्षक, अभिभावक तथा समस्त बुद्धिजीवीहरूलगायत सम्बद्ध सबैबाट पाठ्यक्रम विकास केन्द्र रचनात्मक सुझावको अपेक्षा गर्दछ ।

वि.सं. २०७६

पाठ्यक्रम विकास केन्द्र
सानोठिमी, भक्तपुर

विषय सूची

खण्ड क

माध्यमिक शिक्षा (कक्षा ११ र १२) पाठ्यक्रम २०७६ : परिचय तथा संरचना

१. परिचय

पाठ्यक्रमको विकास, परिमार्जन तथा अद्यावधिक गर्ने कार्य निरन्तर चलिरहने प्रक्रिया हो । परिवर्तित सन्दर्भ, अध्ययन अनुसन्धानका प्रतिवेदन, शिक्षक, प्राध्यापक, विद्यार्थी, बुद्धिजीविलगायत विभिन्न सरोकारवालाबाट प्राप्त सुझाव तथा प्रतिक्रिया, विभिन्न सङ्घसंस्था र पेसासँग आबद्ध सङ्घ सङ्गठनका सुझाव, सूचना तथा सञ्चारका माध्यम र नागरिक समाजबाट पाठ्यक्रमलाई सान्दर्भिक तथा समावेशी बनाउन प्राप्त सकारात्मक सल्लाहका आधारमा राष्ट्रिय पाठ्यक्रम प्रारूप, २०७६ तयार भई नेपाल सरकारबाट स्वीकृत भएको छ । यस प्रारूपले निर्देश गरेको विद्यालय तहको पाठ्यक्रम संरचना एवम् पाठ्यक्रम विकासका मार्गदर्शक सिद्धान्त, ज्ञानको विस्तार तथा सिर्जना, सेवा क्षेत्रमा बढेको प्रतिस्पर्धा तथा राजनीतिक, सामाजिक र आर्थिक क्षेत्रमा आएको परिवर्तनले पाठ्यक्रम परिमार्जनको आवश्यकता औँल्याएका छन् । नेपालमा विद्यालय शिक्षालाई सामाजिक न्यायमा आधारित समृद्ध राष्ट्र निर्माणका लागि सक्षम र प्रतिस्पर्धी नागरिक तयार गर्न सहयोग गर्ने माध्यमका रूपमा विकास गर्नुपर्ने दृष्टिकोण रहेको छ । विद्यालय शिक्षाको उल्लिखित सन्दर्भ तथा दृष्टिकोणमा आधारित भई कक्षा ११ र १२ का लागि पाठ्यक्रम संरचना तथा सो संरचनाअनुसारका विषयगत पाठ्यक्रमहरू विकास गरिएको छ ।

विद्यालयको शिक्षालाई आधारभूत र माध्यमिक गरी दुई तहमा बाँडिएको छ । माध्यमिक शिक्षाले विद्यार्थीहरूमा ज्ञानको खोजी गरी सिकाइ र वास्तविक जीवनबिच सम्बन्ध स्थापित गर्ने, सिद्धान्त र व्यवहारको समन्वय गर्ने तथा स्वपरावर्तित हुँदै ज्ञान, सिप र क्षमतालाई अद्यावधिक गर्ने सक्षमता विकास गराउनु पर्छ । यस तहको शिक्षाले अधिकार, स्वतन्त्रता र समानताको प्रवर्धन गर्ने, आफ्नो कर्तव्यप्रति सचेत हुने, स्वस्थ जीवन शैलीको अभ्यास गर्ने, तार्किक विश्लेषण गरी निर्णय गर्ने, वैज्ञानिक विश्लेषणका आधारमा व्यक्ति, समाज र राष्ट्रको दिगो विकासमा सरिक हुने नागरिक तयार गर्न सहयोग गर्नुपर्छ । विद्यार्थीहरूमा नैतिक आचरण प्रदर्शन गर्ने, सामाजिक सद्भावप्रति संवेदनशील हुने, पर्यावरणीय सन्तुलनप्रति संवेदनशील हुने, द्वन्द्व व्यवस्थापन गर्दै दिगो शान्तिका लागि प्रतिबद्ध रहने, आधुनिक ज्ञान, सिप, सूचना तथा सञ्चार प्रविधिको प्रयोग गर्ने, स्वावलम्बी र व्यवसायमुखी सिपको अभ्यास गर्ने सक्षमताको विकास यस तहको शिक्षाका अपेक्षा हुन् । त्यसै गरी राष्ट्र, राष्ट्रियता र राष्ट्रिय आदर्शको सम्मान गर्ने, समाज स्वीकार्य आचरण र कार्य संस्कृतिको अवलम्बन गर्ने, सहिष्णुभाव राख्ने, सिर्जनशील, कल्पनाशील, उद्यमशील एवम् उच्च सोच र आदर्शमा आधारित व्यवहार गर्ने, समसामयिक चुनौतीहरूको सफल व्यवस्थापन गर्नेलगायतका विशेषताले युक्त स्वावलम्बी, देशभक्त, परिवर्तनमुखी, चिन्तनशील एवम् समावेशी समाज निर्माणमा योगदान गर्न सक्ने सक्षम नागरिक तयार गर्नु यस तहको शिक्षाको कार्यदिशा हो । यसका लागि कक्षा ११ र १२ को पाठ्यक्रम संरचनालाई पुनः संरचित गर्न राष्ट्रिय पाठ्यक्रम विकास तथा मूल्याङ्कन परिषद्बाट अन्तिम रूप दिई र नेपाल सरकारबाट स्वीकृत भएको राष्ट्रिय पाठ्यक्रम प्रारूप, २०७६ लाई आधार मानी माध्यमिक तह (कक्षा ११ र १२) का विभिन्न विषयका पाठ्यक्रम विकास गरिएको हो ।

यो पाठ्यक्रमको पहिलो खण्डमा माध्यमिक शिक्षा (कक्षा ११ र १२) पाठ्यक्रम २०७६ को परिचय तथा संरचना समावेश गरिएको छ । यसमा शिक्षाका राष्ट्रिय उद्देश्य, तहगत सक्षमता तथा पाठ्यक्रमको समग्र संरचना समावेश गरिएको छ । दोस्रो खण्डमा ऐच्छिक विषय चौथो समूहअन्तर्गका विषयगत पाठ्यक्रम समावेश गरिएको छ । यसले विषयगत सिकाइ उपलब्धि, विषयवस्तु, शिक्षण सिकाइका लागि आवश्यक विधि/प्रविधि तथा मूल्याङ्कनका पक्षलाई पनि मार्गनिर्देश गरेको छ । पाठ्यक्रमको क्रमागत स्तरीकरण गेर्न एवम् अघिल्ला र पछिल्ला तहका पाठ्यक्रमबिचको तहगत सङ्गति कायम गर्ने गरी यो पाठ्यक्रम विकास गरिएको छ ।

२. शिक्षाका राष्ट्रिय उद्देश्य

विद्यालय शिक्षाका राष्ट्रिय उद्देश्यहरू निम्नानुसार हुने छन् :

१. प्रत्येक व्यक्तिमा अन्तर्निहित प्रतिभा प्रस्फुटन गरी व्यक्तित्व विकास गर्ने
२. राष्ट्र र राष्ट्रियताप्रति निष्ठावान्, सङ्घीय लोकतान्त्रिक गणतन्त्रका मूल्य मान्यताप्रति प्रतिबद्ध, स्वाभिमानी, सामाजिक तथा सांस्कृतिक विविधतालाई सम्मान गर्ने, चरित्रवान्, नैतिकवान् एवम् जिम्मेवार नागरिक तयार गर्ने

३. श्रमप्रति सम्मान एवम् सकारात्मक सोच भएका, रोजगार तथा स्वरोजगारउन्मुख, उत्पादनमुखी, उद्यमशील र सिपयुक्त नागरिक तयार गर्ने

४. व्यक्तिको सामाजिकीकरणमा सहयोग गर्दै सामाजिक सद्भाव तथा सहिष्णुता र राष्ट्रिय एकता सुदृढ गर्न सहयोग पुऱ्याउने

५. प्राकृतिक तथा राष्ट्रिय सम्पदा र पर्यावरणको संरक्षण, संवर्धन र सदुपयोग गर्दै दिगो विकासमा योगदान गर्ने सचेत नागरिक तयार गर्ने

६. प्रत्येक व्यक्तिमा शान्ति, मानव अधिकार, समानता, समावेशिता र सामाजिक न्यायका मान्यताअनुरूपको आचरण विकास गरी समतामूलक, समावेशी, न्यायपूर्ण र समाजवादउन्मुख राष्ट्र निर्माणमा मदत गर्ने

७. राष्ट्रिय तथा अन्तर्राष्ट्रिय स्तरमा प्रतिस्पर्धी, आधुनिक सूचना तथा सञ्चार प्रविधि प्रयोग गर्न सक्ने विश्वपरिवेश सुहाउँदो दक्ष जनशक्ति तयार गर्ने

८. वैज्ञानिक अवधारणा, तथ्य, सिप, सिद्धान्त तथा प्रविधिको प्रयोग गर्न सक्ने वैज्ञानिक सुझबुझ भएका तथा अनुसन्धानमुखी जनशक्ति तयार गर्ने

९. रचनात्मक तथा समालोचनात्मक चिन्तन गर्ने, जीवनोपयोगी सिप भएका सहिष्णु र भाषिक सक्षमतामा निपुण नागरिक तयार गर्ने

१०. नेपाली मौलिक कला, संस्कृति, सौन्दर्य, आदर्श तथा वैशिष्ट्यहरूको संरक्षण, संवर्धन र विस्तारतर्फ अभिप्रेरित भएका नेपालको इतिहास, भूगोलको ज्ञान भएको, नेपाली पहिचान र जीवनशैलीप्रति गौरव गर्ने नागरिक तयार गर्ने

११. जलवायु परिवर्तन तथा प्राकृतिक एवम् मानव सिर्जित प्रकोपप्रति सचेत रही सम्भावित जोखिम न्यूनीकरण तथा विपत् व्यवस्थापन गर्न सक्षम नागरिक तयार गर्ने

१२. सामाजिक न्यायमा आधारित समृद्ध राष्ट्र निर्माणका निम्ति आवश्यक मानव संसाधनको विकास गर्ने

३. विद्यालय शिक्षाको तहगत संरचना र उमेर

नेपालको विद्यालय शिक्षा आधारभूत र माध्यमिक गरी दुई तहको रहेको छ । एक वर्ष अवधिको प्रारम्भिक बालविकास तथा शिक्षापछि कक्षा १ देखि कक्षा ८ सम्म गरी जम्मा आठ वर्षको आधारभूत शिक्षा कायम गरिएको छ भने कक्षा ९ देखि १२ सम्मको चार वर्ष अवधिको माध्यमिक शिक्षा कायम गरिएको छ । माध्यमिक शिक्षा साधारण, परम्परागत र प्राविधिक तथा व्यावसायिक गरी तीन प्रकारको हुने छ । माध्यमिक शिक्षाको प्राविधिक तथा व्यावसायिक धारतर्फ थप एक वर्ष अवधिको व्यावहारिक अभ्यास समेटिने छ । बालमनोविज्ञान, सिकारुको उमेर तथा सिकाइ क्षमतास्तरका आधारमा विद्यालय शिक्षाको तहगत र कक्षागत खाका देहायबमोजिम हुने छ :

विद्यालयको तह	कक्षा	उमेर समूह	सिकाइ क्षमतास्तर
प्रारम्भिक बालविकास तथा शिक्षा	प्रारम्भिक बालविकास तथा शिक्षा	४ वर्ष	
आधारभूत	कक्षा १- ३	५ देखि ७ वर्षसम्म	तह १
	कक्षा ४ - ५	८ देखि ९ वर्षसम्म	तह २
	कक्षा ६ - ८	१० देखि १२ वर्षसम्म	तह ३
माध्यमिक	कक्षा ९ - १०	१३ देखि १४ वर्षसम्म	तह ४
	कक्षा ११ - १२	१५ देखि १६ वर्षसम्म	तह ५

द्रष्टव्य :

१. माध्यमिक तहको प्राविधिक तथा व्यावसायिक धारतर्फ व्यावहारिक अभ्याससहित एक वर्षको अवधि थप हुने छ ।

२. उल्लिखित तालिकामा निर्दिष्ट उमेर समूहले सम्बन्धित वर्षको उमेर पूरा भएको जनाउने छ ।

४. माध्यमिक शिक्षा (कक्षा ९-१२) का सक्षमता

माध्यमिक शिक्षाले विद्यार्थीमा ज्ञानको खोजी गरी सिकाइ र वास्तविक जीवनबिच सम्बन्ध स्थापित गर्ने, सिद्धान्त र व्यवहारको समन्वय गर्ने, स्वपरावर्तित हुँदै ज्ञान, सिप र क्षमतालाई अद्यावधिक गर्ने सक्षमताको विकास गर्ने छ । त्यसै गरी विद्यार्थीमा अधिकार, स्वतन्त्रता र समानताको प्रवर्धन गर्ने, स्वस्थ जीवनको अभ्यास गर्ने, तार्किक विश्लेषण गरी निर्णय गर्ने, वैज्ञानिक विश्लेषणका आधारमा व्यक्ति, समाज र राष्ट्रको दिगो विकासमा सरिक हुने सक्षमताको विकास यस तहको शिक्षाले गर्ने छ । विद्यार्थीमा नैतिक आचरण प्रदर्शन गर्ने, सामाजिक सद्भावप्रति संवेदनशील हुने, पर्यावरणीय सन्तुलनप्रति संवेदनशील हुने, द्वन्द्व व्यवस्थापन गर्दै दिगो शान्तिका लागि प्रतिबद्ध रहने सक्षमताको विकास पनि यस तहको शिक्षाबाट अपेक्षित छन् । यस तहको शिक्षाबाट आधुनिक ज्ञान, सिप, सूचना तथा सञ्चार प्रविधिको प्रयोग गर्ने, स्वावलम्बी र व्यवसायमुखी सिपको अभ्यास गर्ने, राष्ट्र, राष्ट्रियता र राष्ट्रिय आदर्शको सम्मान गर्ने, समाज स्वीकार्य आचरण र कार्य संस्कृतिको अवलम्बन गर्ने, सहिष्णुभाव राख्ने सक्षमता भएको नागरिक तयार गर्ने अपेक्षा रहेको छ । त्यस्तै, सिर्जनशील, कल्पनाशील, उद्यमशील एवम् उच्च सोच र आदर्शमा आधारित व्यवहार गर्ने, समसामयिक चुनौतीहरूको सफल व्यवस्थापन गर्नेलगायतका विशेषताले युक्त स्वावलम्बी, देशभक्त, परिवर्तनमुखी, चिन्तनशील एवम् समावेशी समाज निर्माणमा योगदान गर्न सक्ने सक्षमतासहितको नागरिक तयार गर्नु माध्यमिक शिक्षाको लक्ष रहेको छ । यसर्थ माध्यमिक तहका विद्यार्थीमा विकास गर्ने अपेक्षा गरिएका सक्षमता निम्नानुसार रहेका छन् :

१. मानवीय मूल्य, मान्यता र लोकतान्त्रिक संस्कार अवलम्बन गर्दै राष्ट्र र राष्ट्रियताको प्रवर्धनका लागि सचेत नागरिकको जिम्मेवारी वहन
२. राष्ट्रिय तथा अन्तर्राष्ट्रिय परिवेशसँग परिचित भई विविधता, सद्भाव र सहअस्तित्वलाई आत्मसात् गर्दै सभ्य, सुसंस्कृत र समतामूलक समाज निर्माणका लागि भूमिका निर्वाह
३. दैनिक क्रियाकलापका साथै प्राज्ञिक क्षेत्रमा आत्मविश्वासका साथ उपयुक्त, सिर्जनात्मक र सान्दर्भिक रूपमा भाषिक सिपको प्रयोग
४. प्रभावकारी सिकाइ, रचनात्मक र विश्लेषणात्मक सोच तथा सामाजिक सम्पर्क र सञ्चारबाट विचारहरूको आदान प्रदान
५. व्यक्तिगत विकास र आवश्यकताको परिपूर्तिका लागि सिकाइप्रति सकारात्मक सोचको विकास तथा स्वअध्ययन एवम् ज्ञान र सिपको खोजी गर्ने बानीको विकास
६. व्यावहारिक गणितीय ज्ञान तथा सिपको बोध तथा प्रयोग र समस्या समाधानमा गणितीय अवधारणा, सिद्धान्त तथा तार्किक सिपको प्रयोग
७. व्यावहारिक वैज्ञानिक ज्ञान, तथ्य, सिद्धान्त र प्रविधिको समुचित प्रयोग
८. वैज्ञानिक खोज तथा अनुसन्धान गर्न आवश्यक प्रक्रियागत सिपहरू हासिल गरी आधुनिक प्रविधिहरूको दैनिक जीवनमा प्रयोग
९. जीवनजगत् र व्यवहारसँगको तादात्म्य बोध गरी जीवनोपयोगी सिप (Life skills) को प्रयोग गर्दै समाजसापेक्ष व्यवहार प्रदर्शन
१०. स्वास्थ्यप्रतिको सचेततासहित वातावरण संरक्षण र संवर्धन तथा जनसङ्ख्या व्यवस्थापनमा सक्रिय सहभागिता
११. प्राकृतिक तथा सामाजिक घटनाको विश्लेषण, तिनको कारण र असर बोध तथा सकारात्मक व्यवहार प्रदर्शन
१२. श्रमप्रति सम्मान गर्दै कामको संसारमा आत्मविश्वाससाथ तयारी
१३. प्राविधिक ज्ञान, सिप, प्रवृत्ति तथा पेसागत र व्यवस्थापकीय क्षमताको विकास र प्रयोग
१५. उच्च तहमा अध्ययनको आधार विकास

५. माध्यमिक शिक्षा (कक्षा ११-१२) का सक्षमता

माध्यमिक शिक्षा (कक्षा ११-१२) का सक्षमताहरू निम्नानुसार हुने छन् :

१. मानवीय मूल्य, मान्यता र लोकतान्त्रिक संस्कार अवलम्बन गर्दै राष्ट्र र राष्ट्रियताको प्रवर्धनका लागि सचेत नागरिकको जिम्मेवारी वहन
२. राष्ट्रिय तथा अन्तर्राष्ट्रिय परिवेशसँग परिचित भई विविधता, सद्भाव र सहअस्तित्वलाई आत्मसात् गर्दै सभ्य सुसंस्कृत र समतामूलक समाज निर्माणका लागि भूमिका निर्वाह

३. दैनिक क्रियाकलापका साथै प्राज्ञिक क्षेत्रमा आत्मविश्वासका साथ उपयुक्त, सिर्जनात्मक र सान्दर्भिक रूपमा भाषिक एवम् सञ्चार सिपको प्रयोग
४. व्यक्तिगत विकास र आवश्यकताको परिपूर्तिका लागि सिकाइप्रति सकारात्मक सोचको विकास तथा स्वअध्ययन एवम् ज्ञान र सिपको खोजी गर्ने बानीको विकास
५. जीवन, जीविका र वृत्ति एवम् सामाजिक सांस्कृतिक व्यवहारसँग तादात्म्य बोध गरी जीवनोपयोगी सिप (Life skills) को विकास
६. स्वस्थ्य जीवनशैलीको अवलम्बन एवम् वातावरण संरक्षण र दिगो विकासका लागि भूमिका निर्वाह
७. प्राकृतिक तथा सामाजिक घटनाको विश्लेषण, तिनको कारण र असर बोध तथा सकारात्मक व्यवहार प्रदर्शन
८. श्रमप्रति सम्मान गर्दै कामको संसारमा आत्मविश्वासको साथ प्रवेश
९. प्राविधिक ज्ञान, सिप, प्रवृत्ति तथा पेसागत र व्यवस्थापकीय क्षमताको विकास र प्रयोग
१०. उच्च तहमा अध्ययनका लागि विषयगत/विधागत आधार विकास

६. विद्यालय शिक्षाको पाठ्यक्रम संरचना

विद्यालय शिक्षाको पाठ्यक्रम संरचना निम्नानुसार प्रस्तुत गरिएको छ :

(क) प्रारम्भिक बालविकास तथा शिक्षा

प्रारम्भिक बालविकास तथा शिक्षा पाठ्यक्रमको मुख्य लक्ष्य बालबालिकाको सर्वाङ्गीण विकास गर्नु र उनीहरूलाई सिकाइप्रति प्रेरित गरी सिकाइका लागि आधारशिला खडा गर्नु हुने छ । प्रारम्भिक बालविकास र शिक्षाको पाठ्यक्रम ४ वर्षका बालबालिकाको उमेरगत विकासात्मक पक्षलाई ध्यान दिई एकीकृत सिद्धान्तअनुसार विकास गरिने छ । यसमा उमेरअनुसारका शारीरिक, संवेगात्मक, सामाजिक, सांस्कृतिक, नैतिक, बौद्धिक तथा मानसिक, स्वास्थ्य, पोषण, सुरक्षा तथा वातावरण र सिर्जनात्मक सिपहरू विकास गराउनाका साथै मौखिक भाषिक सिप, पूर्वसङ्ख्या वा पूर्वगणितीय सिपलगायतका सिप विकास गराइन्छ । यस तहमा औपचारिकरूपमा पढाइ र लेखाइका सिप तथा क्रियाकलाप भने उमेरमा दृष्टिले समावेश गरिनु हुन्न ।

(ख) आधारभूत शिक्षा

(अ) आधारभूत शिक्षा (कक्षा १-३)

आधारभूत शिक्षा (कक्षा १-३) मा एकीकृत स्वरूपको पाठ्यक्रम हुने छ । सिकाइका क्षेत्रहरू (Themes) पहिचान गरी विषय र सिकाइका क्षेत्रका आधारमा बहुविषयात्मक (Multidisciplinary) तथा अन्तरविषयगत (Interdisciplinary) ढाँचामा पाठ्यक्रम आधारित गरिने छ । यसअनुसार एकीकृत विषयक्षेत्रहरूले समेट्न नसकेका सिकाइ उपलब्धिहरूलाई समेट्ने गरी विषयगत सिकाइ क्षेत्रहरूसमेत रहन सक्ने छन् । भाषागत विषयसँग सम्बन्धित विषयक्षेत्रहरू पठनपाठन सम्बन्धित भाषामा नै गर्नुपर्ने छ । यस तहमा बालबालिकाहरूले आफ्नो मातृभाषामा सिक्ने अवसर प्राप्त गर्ने छन् । यस्तो पाठ्यक्रम क्रियाकलापमुखी हुने छ । यसले विद्यार्थीहरूमा विषयवस्तुको ज्ञानका साथै विभिन्न किसिमका व्यवहारकुशल सिप विकासमा जोड दिने छ । यस तहमा बालबालिकाहरूले आफ्नो मातृभाषामा सिक्ने अवसर प्राप्त गर्ने छन् । आधारभूत तह (कक्षा १-३) मा भाषा, गणित, विज्ञान, स्वास्थ्य र शारीरिक शिक्षा, सामाजिक अध्ययन, सिर्जनात्मक कला, मातृभाषा तथा स्थानीय विषयका सिकाइ क्षेत्रहरू रहे पनि एकीकृत सिद्धान्तअनुसार नेपाली, गणित, अङ्ग्रेजी, हाम्रो सेरोफेरो र मातृभाषा/स्थानीय विषयक्षेत्रमा उल्लिखित सबै विषयलाई समावेश गरिएको छ ।

(आ) आधारभूत शिक्षा (कक्षा ४-५)

आधारभूत शिक्षा (कक्षा ४-५) मा विद्यार्थीहरूलाई भाषा, गणित, विज्ञान तथा प्रविधि, सामाजिक अध्ययन तथा मानवमूल्य शिक्षा, स्वास्थ्य, शारीरिक तथा सिर्जनात्मक कला, मातृभाषा तथा स्थानीय विषयका सिकाइ क्षेत्रहरू प्रदान गरिने छ । दैनिक जीवनका लागि आवश्यक अन्तरवैयक्तिक सिपहरू, स्वसचेतना सिपहरू, समालोचनात्मक तथा सिर्जनात्मक सोचाइका सिपहरू, निर्णय गर्ने सिपहरू, सूचना प्रविधिसम्बन्धी सिपहरू र नागरिक चेतनासम्बन्धी सिपहरू एकीकृत गरी पाठ्यक्रम विकास गरिने छ ।

(इ) आधारभूत शिक्षा (कक्षा ६-८)

आधारभूत शिक्षा (कक्षा ६-८) मा विद्यार्थीहरूलाई भाषा, गणित, विज्ञान तथा प्रविधि, सामाजिक, वातावरण, जनसङ्ख्या, मानवमूल्य, स्वास्थ्य शारीरिक तथा स्थानीय विषयका सिकाइ क्षेत्रहरू नै प्रदान गरिने छ । स्थानीय आवश्यकतामा आधारित अध्ययनअन्तर्गत विद्यार्थीहरूलाई मातृभाषा वा स्थानीय कला, संस्कृति, सिप, संस्कृत भाषा जस्ता विषयवस्तु समावेश गर्न सकिने छ । दैनिक जीवनका लागि आवश्यक अन्तरवैयक्तिक सिपहरू, स्वसचेतना सिपहरू, समालोचनात्मक तथा सिर्जनात्मक सोचाइका सिपहरू, निर्णय गर्ने सिपहरू, सूचना प्रविधिसम्बन्धी सिपहरू र नागरिक चेतनासम्बन्धी सिपहरू एकीकृत गरी पाठ्यक्रम विकास गरिने छ । कक्षा ६-८ मा संस्कृत/गुरुकुल/वेद विद्याश्रम शिक्षाका लागि भने विषय संरचनामा केही भिन्नता हुने छ ।

(ख) माध्यमिक शिक्षा

विद्यालय शिक्षामा कक्षा ९ देखि १२ सम्मलाई माध्यमिक शिक्षा कायम गरिएको छ । माध्यमिक शिक्षालाई साधारण, प्राविधिक तथा व्यावसायिक र परम्परागत गरी तीन प्रकारमा वर्गीकरण गरिएको छ । गुरुकुल, गोन्पा विहार, मदर्सा, मुन्धुमलगायतका परम्परागत शिक्षा पद्धतिलाई पनि माध्यमिक शिक्षामा समेटिएको छ । माध्यमिक शिक्षाको पाठ्यक्रम संरचना एकलपथको हुने छ । कक्षा ९ र १० को साधारण धारतर्फ प्रत्येक कक्षामा नेपाली, अङ्ग्रेजी, गणित, विज्ञान तथा प्रविधि र सामाजिक अध्ययन गरी पाँचओटा अनिवार्य विषयहरू र दुईओटा ऐच्छिक विषयहरू रहने छन् । यसै गरी कक्षा ११ र १२ को साधारण शिक्षातर्फ अनिवार्य विषयका रूपमा अङ्ग्रेजी र नेपालीलाई दुवै कक्षामा, सामाजिक अध्ययनलाई कक्षा ११ मा र जीवनोपयोगी शिक्षालाई कक्षा १२ मा समावेश गरिएको छ भने कक्षा ११ र १२ प्रत्येकमा ऐच्छिक विषय तीन तीनओटा समावेश गरिएको छ । यसको अतिरिक्त कक्षा ११ र १२ मा अतिरिक्त ऐच्छिक विषयका रूपमा थप एक विषय समावेश गर्न सकिने छ । त्यसै गरी माध्यमिक शिक्षातर्फ कक्षा ११ र १२ मा सामाजिक अध्ययन र जीवनोपयोगी शिक्षा विषयअन्तर्गत न्यूनतम एक पाठ्यघण्टा बराबरको सूचना प्रविधिसम्बन्धी विषयवस्तु समावेश गरिने छ । माध्यमिक शिक्षा कक्षा ११-१२ को पाठ्यक्रम संरचना निम्नानुसार हुने छ :

(अ) साधारण शिक्षा

माध्यमिक शिक्षा (कक्षा ९- १०)

क्र. स.	विषय	पाठ्य घण्टा (Credit hour)	वार्षिक कार्यघण्टा
१.	नेपाली	५	१६०
२.	अङ्ग्रेजी	५	१६०
३.	गणित	५	१६०
४.	विज्ञान तथा प्रविधि	५	१६०
५.	सामाजिक अध्ययन	४	१२८
६.	ऐच्छिक प्रथम	४	१२८
७.	ऐच्छिक द्वितीय	४	१२८
	जम्मा	**३२**	**१०२४**

माध्यमिक शिक्षा (कक्षा ११ - १२)

क्र.सं.	विषय	कक्षा ११		कक्षा १२	
		पाठ्यघण्टा (Credit hour)	वार्षिक कार्यघण्टा	पाठ्यघण्टा (Credit hour)	वार्षिक कार्यघण्टा
१.	नेपाली	३	९६	३	९६
२.	अङ्ग्रेजी	४	१२८	४	१२८
३.	सामाजिक अध्ययन	५	१६०	–	–
४	जीवनोपयोगी शिक्षा	–	–	५	१६०
५	ऐच्छिक प्रथम	५	१६०	५	१६०

६	ऐच्छिक द्वितीय	५	१६०	५	१६०
७	ऐच्छिक तृतीय	५	१६०	५	१६०
जम्मा		२७	८६४	२७	८६४
८	थप ऐच्छिक	५	१६०	५	१६०

द्रष्टव्य :

१. कक्षा ११ र १२ प्रत्येक कक्षामा सामाजिक अध्ययन तथा जीवनोपयोगी शिक्षाअन्तर्गत एक एक पाठ्यघण्टाको सूचना प्रविधिको व्यावहारिक अभ्यास समावेश गरिएको छ ।

२. ऐच्छिक तीन विषयहरूको छनोट विद्यार्थीको रुचि, आवश्यकता, उपलब्ध शिक्षक तथा स्रोतसाधनका आधारमा स्थानीय सरकारको समन्वय र सहजीकरणमा विद्यालयले गर्ने छ । यसरी विषय छनोट गर्दा ऐच्छिक प्रथम, द्वितीय, तृतीय र चतुर्थ समूहमध्ये कुनै तीन समूहबाट एक एक विषय गरी जम्मा तीन विषय छनोट गर्नुपर्ने छ । विद्यार्थीले बाँकी रहेको ऐच्छिक समूहबाट कक्षा ११ र १२ प्रत्येकमा एक विषय थप ऐच्छिकका रूपमा अध्ययन गर्न सक्ने छन् । सामान्यतया ऐच्छिक विषय छनोट गर्दा कक्षा ११ मा अध्ययन गरेको विषय वा सो विषयसँग सम्बन्धित विषय कक्षा १२ मा लिनुपर्ने छ । कक्षा ११ मा अध्ययन गरेको विषय वा सो विषयसँग सम्बन्धित विषय कक्षा १२ मा नभएमा सोही समूहबाट सट्टामा तोकिएको विषय लिनुपर्ने छ । विषय छनोटका लागि पाठ्यक्रम विकास केन्द्रले आवश्यक मार्गदर्शन विकास गर्न सक्ने छ ।

३. ऐच्छिक विषयका रूपमा कक्षा ११ र १२ दुवैमा भौतिक, रसायनिक र जीव विज्ञान तीनै विषय अध्ययन गर्ने विद्यार्थीहरूले चाहेमा गणित विषय अतिरिक्त ऐच्छिक विषयका रूपमा अध्ययन गर्न सक्ने छन् ।

४. विदेशी विद्यार्थीहरूका लागि अनिवार्य नेपाली विषयको सट्टा वैकल्पिक अङ्ग्रेजी (Alternative English) विषय अध्ययन गर्न पाउने व्यवस्था गर्न सकिने छ ।

(आ) परम्परागत शिक्षा : संस्कृत/वेद विद्याश्रम/गुरुकुल शिक्षा

माध्यमिक शिक्षा (कक्षा ९- १०)

क्र.स.	**विषय**	**पाठ्यघण्टा** (Credit hour)	**वार्षिक कार्यघण्टा**
१.	नेपाली	५	१६०
२.	अङ्ग्रेजी/संस्कृत रचना	५	१६०
३.	गणित	५	१६०
४.	वेद वा नीतिशास्त्र वा विज्ञान तथा प्रविधि	५	१६०
५.	संस्कृत भाषा तथा व्याकरण	४	१२८
६.	ऐच्छिक प्रथम	४	१२८
७.	ऐच्छिक द्वितीय	४	१२८
	जम्मा	**३२**	**१०२४**

द्रष्टव्य :

१. वेद भन्नाले शुक्लयजुर्वेद वा सामवेद वा ऋग्वेद वा अथर्ववेदमध्ये कुनै एक विषय छनोट गर्नुपर्ने छ ।

२. ऐच्छिक प्रथम विषयमा कर्मकाण्ड, फलित ज्योतिष, योग शिक्षा, वास्तुशास्त्र, आयुर्वेद, प्राकृतिक चिकित्सा र ऐच्छिक गणित विषयमध्ये एक विषय छनोट गर्नुपर्ने छ ।

३. ऐच्छिक द्वितीय पत्रमा संस्कृतका शास्त्रीय विषयमध्ये कुनै एक विषय छनोट गर्नुपर्ने छ । तर विज्ञान तथा प्रविधि विषयको सट्टामा वेद विषयको छनोट गरेमा ऐच्छिक द्वितीयमा वेद विषय छनोट गर्न पाइने छैन ।

माध्यमिक शिक्षा कक्षा ११-१२

क्र. सं.		कक्षा ११		कक्षा १२	
	विषय	पाठ्यघण्टा (Credit hour)	वार्षिक कार्यघण्टा	पाठ्यघण्टा (Credit hour)	वार्षिक कार्यघण्टा
१	नेपाली	३	९६	३	९६
२	अङ्ग्रेजी वा संस्कृत रचना	४	१२८	४	१२८
३	सामाजिक अध्ययन	५	१६०	–	–

४	जीवनोपयोगी शिक्षा	–	–	५	१६०
५	संस्कृत भाषा तथा व्याकरण	५	१६०	५	१६०
६	ऐच्छिक प्रथम	५	१६०	५	१६०
७	ऐच्छिक द्वितीय	५	१६०	५	१६०
जम्मा		**२७**	**८६४**	**२७**	**८६४**
८	थप ऐच्छिक	५	१६०	५	१६०

द्रष्टव्य :

१. उल्लिखित विषय बाहेक कक्षा ११ र १२ प्रत्येक कक्षामा सामाजिक अध्ययन तथा जीवनोपयोगी शिक्षाअन्तर्गत एक एक पाठ्यघण्टाको सूचना प्रविधिको व्यावहारिक अभ्यास समावेश गरिने छ ।

२. विद्यार्थीले कक्षा ११ र १२ प्रत्येक कक्षामा ५ पाठ्यघण्टाको थप ऐच्छिक विषय एक अध्ययन गर्न सक्ने छन् । थप ऐच्छिक विषयको विवरण यसै खण्डमा दिइएको छ ।

(इ) परम्परागत शिक्षा: गोन्पा/मदर्सा

माध्यमिक शिक्षा (कक्षा ९- १०)

क्र.स.	**विषय**	**पाठ्यघण्टा** (Credit hour)	**वार्षिक कार्यघण्टा**
१.	नेपाली	५	१६०
२.	अङ्ग्रेजी	५	१६०
३.	गणित	५	१६०
४.	विज्ञान तथा प्रविधि	५	१६०
५.	सामाजिक अध्ययन	४	१२८
६.	ऐच्छिक प्रथम	४	१२८
७.	ऐच्छिक द्वितीय	४	१२८
	जम्मा	**३२**	**१०२४**

द्रष्टव्य :

१. सामाजिक अध्ययन विषयलाई सम्बन्धित परम्परागत शिक्षा विषयको विषयवस्तुलाई समेत अनुकूलन गरी सम्बन्धित भाषामा नै पठनपाठन गर्न सकिने छ ।

२. गोन्पा शिक्षाको ऐच्छिक विषयको रूपमा साधारण शिक्षाका ऐच्छिक विषयका अतिरिक्त भोट भाषा र बौद्ध शिक्षा पठनपाठन गर्न सकिने छ ।

३. मदर्सा शिक्षाको ऐच्छिक विषयका रूपमा साधारण शिक्षाको ऐच्छिक विषयका अतिरिक्त अरेबिक भाषा साहित्य र व्याकरण, उर्दू भाषा साहित्य र व्याकरण एवम् दिनियात विषय पठनपाठन गर्न सकिने छ ।

४. मदर्सातर्फ अङ्ग्रेजी विषयका सट्टामा अरबी साहित्य र विज्ञान तथा प्रविधि विषयका सट्टामा सिरत र इस्लामी विषय पठनपाठन गराउन सकिने छ ।

माध्यमिक शिक्षा (कक्षा ११- १२)

क्र.स.	विषय	कक्षा ११		कक्षा १२	
		पाठ्यघण्टा (Credit hour)	वार्षिक कार्यघण्टा	पाठ्यघण्टा (Credit hour)	वार्षिक कार्यघण्टा
१	नेपाली	३	९६	३	९६
२	अङ्ग्रेजी वा बौद्ध शिक्षा वा उर्दू	४	१२८	४	१२८

	व्याकरण र साहित्य				
३	सामाजिक अध्ययन	५	१६०	–	–
४	जीवनोपयोगी शिक्षा	–	–	५	१६०
५	ऐच्छिक प्रथम (बौद्ध दर्शन वा कुरान)	५	१६०	५	१६०
६	ऐच्छिक द्वितीय (ज्योतिष, भैषज्य, शिल्प विद्या, बौद्ध कर्मकाण्ड, कम्प्युटर)वा (हदिस र असुले हदिस)	५	१६०	५	१६०
७	ऐच्छिक तृतीय (अङ्गेजी, जापानिज, चाइनिज, पाली भाषा, भोट भाषा, संस्कृत रचना)/ (मिरास विज्ञान)	५	१६०	५	१६०
जम्मा		२७	८६४	२७	८६४
८	थप ऐच्छिक	५	१६०	५	१६०

द्रष्टव्य :

१. इच्छुक विद्यार्थीले कक्षा ११ र १२ प्रत्येक कक्षामा ५ पाठ्यघण्टाको थप ऐच्छिक विषय एक अध्ययन गर्न सक्ने छन् । थप ऐच्छिक विषय साधारण धारतर्फका ऐच्छिक समूहबाट छनोट गर्नुपर्ने छ ।

२. प्राविधिक तथा व्यावसायिक धारतर्फको पाठ्यक्रम संरचना तथा विषयहरूको विवरण पाठ्यक्रमको यस खण्डमा समावेश नगरी माध्यमिक शिक्षा (प्राविधिक तथा व्यावसायिक) पाठ्यक्रममा समावेश गरिने छ ।

६. कक्षा ११ र १२ मा पठनपाठन हुने अनिवार्य विषय, ऐच्छिक विषयको छनोटका लगि विषयगत समूह तथा विषयको कोड

(क) अनिवार्य विषय

सि. नं.	कक्षा ११ का विषय र कोड	कक्षा १२ का विषय र कोड
१	नेपाली [Nep. 001]	नेपाली [Nep. 002]
२	English [Eng. 003]	English [Eng. 004]
३	सामाजिक अध्ययन [Soc. 005]	जीवनोपयोगी शिक्षा [Lif. 008]

(ख) ऐच्छिक विषय

(अ) ऐच्छिक पहिलो समूह

क्र.स.	कक्षा ११ का ऐच्छिक विषय र कोड	कक्षा १२ का ऐच्छिक विषय र कोड
१.	भौतिक विज्ञान (Physics) [Phy. 101]	भौतिक विज्ञान (Physics) [Phy. 102]
२.	लेखाविधि (Accounting) [Acc. 103]	लेखाविधि (Accounting) [Acc. 104]
३.	ग्रामीण विकास (Rural Development) [Rd. 105]	ग्रामीण विकास (Rural Development) [Rd. 106]
४	विधिशास्त्र र कानुनी सिद्धान्त (Jurispudence and	नेपालको न्याय र कानुन प्रणाली

	Legal Theories [Jlt. 107]	(Nepalese Legal system) [Nls. 110]
५.	स्वास्थ्य तथा शारीरिक शिक्षा (Health and Physical Education) [Hpe. 111]	स्वास्थ्य तथा शारीरिक शिक्षा (Health and Physical Education) [Hpe.112]
६	खेलकुद विज्ञान (Sports Science) [Sps. 113]	खेलकुद विज्ञान (Sports Science) [Sps.114]
७	बालविकास र सिकाइ (Child Development and Learning) [Cdl. 115]	शैक्षणिक पद्धति र मूल्याङ्कन (Instructional Pedagogy and Evaluation) [Ipe. 118]
८	मनोविज्ञान (Psychology) [Psy. 119]	मनोविज्ञान (Psychology) [Nls. 120]
९	इतिहास (History) [His. 121]	इतिहास (History) [His. 122]
१०	लैङ्गिक अध्ययन (Gender Studies) [Ges. 123]	लैङ्गिक अध्ययन (Gender Studies) [Ges. 124]
११	अतिथि सत्कार व्यवस्थापन (Hospitality Management) [Hom. 125]	अतिथि सत्कार व्यवस्थापन (Hospitality Management) [Hom. 126]
१२	बाली विज्ञान (Agronomy) [Agr. 127]	बाली विज्ञान (Agronomy) [Agr. 128]
१३	प्राकृतिक चिकित्सा (Naturopathy) [Nat. 129]	प्राकृतिक चिकित्सा (Naturopathy) [Nat. 130]
१४	मानवमूल्य शिक्षा (Human Value Education) [Hve. 131]	मानवमूल्य शिक्षा (Human Value Education) [Hve. 132]
१५	मूर्तिकला (Sculpture) [Scu. 133]	मूर्तिकला(Sculpture) [Scu. 134]

(आ) ऐच्छिक दोस्रो समूह

क्र.स.	**कक्षा ११ का ऐच्छिक विषय र कोड**	**कक्षा १२ का ऐच्छिक विषय र कोड**
१.	जीव विज्ञान (Biology) [bio. 201]	जीव विज्ञान (Biology) [bio. 202]
२.	शिक्षा र विकास (Education and Development) [Ed. 203]	शिक्षा र विकास (Education and Development) [Ed. 204]
३	भूगोल (Geography) [Geo. 205]	भूगोल (Geography) [Geo. 206]
४.	कार्यविधि कानुन (Procedural Law) [Prl. 207]	कानुनको मस्यौदा प्रक्रिया (Legal Drafting) [Led. 210]
५	समाजशास्त्र (Sociology) [Soc. 211]	समाजशास्त्र (Sociology) [Soc. 212]
६	आयुर्वेद (Ayurbed) [Ayu. 213]	आयुर्वेद (Ayurbed) [Au. 214]
७	व्यवसाय अध्ययन (Business Studies) [Bus. 215]	व्यवसाय अध्ययन (Business Studies) [Bus. 216]
८	भाषा विज्ञान (Linguistics) [Lin. 217]	भाषा विज्ञान (Linguistics) [Lin. 218]
९	राजनीति शास्त्र (Political Science) [Pol. 219]	राजनीति शास्त्र (Political Science) [Pol. 220]
१०	दर्शनशास्त्र (Philosophy) [Phi. 221]	दर्शनशास्त्र (Philosophy) [Phi. 222]
११	जनसङ्ख्या अध्ययन (Population Studies) [Pos. 223]	जनसङ्ख्या अध्ययन (Population Studies)

		[Pos. 224]
१२	बागवानी (Horticulture) (फलफूल, तरकारी, पुष्प र च्याउ खेती) [Hor. 225]	बागवानी (Horticulture) (फलफूल, तरकारी, पुष्प र च्याउ खेती) [Hor. 226]
१३	खाद्य र पोषण (Food and Nutrition) [Fon. 227]	खाद्य र पोषण (Food and Nutrition) [Fon. 228]
१४	नृत्य (Dance) [Dan. 229]	नृत्य (Dance) [Dan. 230]
१५	कम्प्युटर विज्ञान (Computer Science) [Com. 231]	कम्प्युटर विज्ञान (Computer Science) [Com. 232]

(इ) ऐच्छिक तेस्रो समूह

क्र.स.	**कक्षा ११ का ऐच्छिक विषय र कोड**	**कक्षा १२ का ऐच्छिक विषय र कोड**
१.	रसायन विज्ञान (Chemistry) [Che. 301]	रसायन विज्ञान (Chemistry) [Che. 302]
२	अर्थशास्त्र (Economics) [Eco. 303]	अर्थशास्त्र (Economics) [Eco. 304]
३	पर्यटन र पर्वतारोहण अध्ययन (Tourism and Mountaineering Studies) [Tms. 305]	पर्यटन र पर्वतारोहण अध्ययन (Tourism and Mountaineering Studies) [Tms. 306]
४	बजारशास्त्र (Marketing) [Mar. 307]	बजारशास्त्र (Marketing) [Mar.308]
५	बुढ्यौली तथा स्याहार शिक्षा (Gerontology and Care Taking Education) [Gct. 309]	बुढ्यौली तथा स्याहार शिक्षा (Gerentology and Care Taking Education) [Gct. 310]
६	योग (Yoga) [yog. 311]	योग (Yoga) [Yog. 312]
७	वाद्यवादन (Vocal/Instrumetal) [Voc. 313]	वाद्यवादन (Vocal/Instrumetal) [voc. 314]
८	सिलाइ तथा बुनाइ (Sewing and Knitting) [Sek. 315]	सिलाइ तथा बुनाइ (Sewing and Knitting) [Sek. 316]
९	संवैधानिक कानुन (Constitutional Law) [Col. 317]	देवानी तथा फौजदारी कानुन र न्याय (Civil and Criminal law and justice) [Ccl. 320]
१०	आमसञ्चार (Mass Communication) [Mac. 321]	आमसञ्चार (Mass Communication) [Mac.322]
११	संस्कृति (Culture) [Cul. 323]	संस्कृति (Culture) [Cul. 324]
१२	फेसन डिजाइनिङ (Fashion Designing) [Fad. 325]	फेसन डिजाइनिङ (Fashion Designing) [Fad. 326]
१३	मूर्तिकला (Sculpture) [Scu. 327]	मूर्तिकला (Sculpture) [Scu. 328]
१४	पशुपालन, पन्छीपालन र माछापालन (Animal Husbandry, Poultry and Fisheries) [Apf. 329]	पशुपालन, पंक्षीपालन र माछापालन (Animal Husbandry, Poultry and Fisheries) [Apf. 330]
१५	नेपाली (Nepali) [Nep. 331]	नेपाली (Nepali) [Nep. 332]

१६	अङ्ग्रेजी (English) [Eng. 333]	अङ्ग्रेजी (English) [Eng. 334]
१७	मैथिली [Mai. 335]	मैथिली [Mai. 336]
१८	नेवारी [New 337]	नेवारी [New. 338]
१९	हिन्दी [Hin. 339]	हिन्दी [Hin. 340]
२०	चिनियाँ [Chi. 341]	चिनियाँ [Chi. 342]
२१	जर्मन [Jer. 343]	जर्मन [Jer. 344]
२२	जापानिज [Jap. 345]	जापानिज [Jap 346]
२३	कोरियन [Kor. 347]	कोरियन [Kor.348]
२४	उर्दू [Urd. 349]	उर्दू [Urd. 352]
२५	फ्रेन्च [Fre. 353]	फ्रेन्च [Urd. 354]
२६	हिब्रू [Heb. 355]	हिब्रू [Heb. 356]
२७	अरेबिक [Are. 357]	अरेबिक [Urd.358]
२८	संस्कृत [San. 359]	संस्कृत [San. 360]
२९	पाककला (Culinary Arts) [Cua. 361]	पाककला (Culinary Arts) [Cua. 362]

(ई) ऐच्छिक चौथो समूह

क्र. स.	**कक्षा ११ का ऐच्छिक विषय र कोड**	**कक्षा १२ का ऐच्छिक विषय र कोड**
१.	गणित (Mathematics) [Mat. 401]	गणित (Mathematics) [Mat. 402]
२.	प्रायोगिक गणित (Applied mathematics) [Ama. 403]	प्रायोगिक गणित (Applied Mathematics) [Ama. 404]
३.	वाणिज्य गणित (Business Mathematics) [Bmt. 405]	वाणिज्य गणित (Business Mathematics) [Bmt. 406]
४	मानव अधिकार (Human rights) [Hur. 407]	मानव अधिकार (Human rights) [Hur. 408]
५	पुस्तकालय तथा सूचना विज्ञान (Library and Information Science) [Lis. 409]	पुस्तकालय तथा सूचना विज्ञान (Library and Information science) [Lis. 410]
६	गृह विज्ञान (Home Science) [Hos. 411]	गृह विज्ञान (Home Science) [Hos. 412]
७	वातावरण विज्ञान (Environment Science) [Ens. 413]	वातावरण विज्ञान (Environment Science) [Ens.414]
८	साधारण कानुन (General Law) [Gel. 415]	साधारण कानुन (General Law) [Gel.416]
९	वित्तशास्त्र (Finance) [Fin. 417]	वित्तशास्त्र (Finance) [Fin. 418]
१०	सहकारी व्यवस्थापन (Co-operative management) [Com. 419]	सहकारी व्यवस्थापन (Co-operative Management) [Urd. 420]
११	बौद्ध अध्ययन (Buddhist Studies) [Bud. 421]	बौद्ध अध्ययन (Buddhist Studies) [Bud.422]
१२	प्रायोगिक कला (Applied Arts) [Apa. 423]	प्रायोगिक कला (Applied Arts) [Apa. 424]
१३	गायन (Signing) [Sig. 425]	गायन (Signing) [Sig. 426]
१४	चित्रकला (Painting) [Pai. 427]	चित्रकला (Painting) [Pai.428]

१५	रेसम खेती र मौरीपालन (Sericulture and Bee Keeping) [Sbk. 429]	रेसम खेती र मौरीपालन (Sericulture and Bee Keeping) [Sbk. 430]
१६	सौन्दर्यकला र केशकला (Beautician and Hair Dressing) [Beh. 431]	सौन्दर्यकला र केशकला (Beautician and Hair Dressing) [Beh.432]
१७	औषधिजन्य जडीबुटी (Medicinal Herbals) [Meh. 433]	औषधिजन्य जडीबुटी (Medicinal Herbals) [Meh.434]
१८	प्लम्बिङ र वाइरिङ (Plumbing and Wiring) [Plw. 435]	प्लम्बिङ र वाइरिङ (Plumbing and Wiring) [Plw. 436]
१९	आन्तरिक सजाबट (Internal Decoration) [Ind. 437]	आन्तरिक सजाबट (Internal Decoration) [Ind. 438]
२०	होटेल व्यवस्थापन (Hotel Management) [Hom. 439]	होटेल व्यवस्थापन (Hotel Management) [Hom. 440]

माध्यमिक शिक्षा (कक्षा ११-१२) संस्कृततर्फका विषय

(क) अनिवार्य विषय

सि. नं.	कक्षा ११ का विषय र कोड	कक्षा १२ का विषय र कोड
१	संस्कृत रचना [Saw. 011]	संस्कृत रचना [Saw. 012]
२	संस्कृत भाषा तथा व्याकरण [Slg. 017]	संस्कृत भाषा तथा व्याकरण [Slg. 018]

द्रष्टव्य : अनिवार्य विषयहरू नेपाली [Nep. 001 र Nep. 002], अङ्ग्रेजी [Eng. 003 र Eng. 004], सामाजिक अध्ययन [Soc. 005], जीवनोपयोगी शिक्षा [Lif. 008] साधारण धारमै उल्लेख भएअनुसार हुनेछन् । विद्यार्थीले अङ्ग्रेजी [Eng. 003 र Eng. 004] को सट्टा संस्कृत रचना [Saw. 011 र Saw. 012] विषय अध्ययन गर्न सक्नेछन् ।

(ख) ऐच्छिक विषय

(अ) ऐच्छिक पहिलो समूह

क्र. स.	कक्षा ११ का ऐच्छिक विषय र कोड	कक्षा १२ का ऐच्छिक विषय र कोड
१	शुक्लयजुर्वेद [Yab 501]	शुक्लयजुर्वेद [Yab. 502]
२	सामवेद [Sab. 503]	सामवेद [Sab. 504]
३	ऋग्वेद [Rib. 505]	ऋग्वेद [Rib. 506]
४	अथर्ववेद [Aab. 507]	अथर्ववेद [Aab. 508]
५	व्याकरण [Gra. 509]	व्याकरण [Gra. 510]
६	सिद्धान्त ज्योतिष [Sij. 511]	सिद्धान्त ज्योतिष [Sij. 512]
७	न्याय [Nay. 513]	न्याय [Nay. 514]
८	दर्शनशास्त्र [Dar. 515]	दर्शनशास्त्र [Dar. 516]
९	संस्कृत साहित्य [Sas. 517]	संस्कृत साहित्य [Sas. 518]
१०	इतिहास पुराण [Itp. 519]	इतिहास पुराण [Itp. 520]
११	नीतिशास्त्र [Nis. 521]	नीतिशास्त्र [Nis. 522]

(आ) ऐच्छिक दोस्रो समूह

क्र. स.	कक्षा ११ का ऐच्छिक विषय र कोड	कक्षा १२ का ऐच्छिक विषय र कोड
१	प्राकृतिक चिकित्सा (Naturopathy) [Nat. 129]	प्राकृतिक चिकित्सा (Naturopathy) [Nat. 130]
२	आयुर्वेद (Ayurbed) [Ayu. 213]	आयुर्वेद (Ayurbed) [Au. 214]
३	योग (Yog) [yog. 311]	योग (Yog) [Yog. 312]
४	कर्मकाण्ड [Kar. 531]	कर्मकाण्ड [Kar. 532]
५	फलित ज्योतिष [Faj.533]	फलित ज्योतिष [Faj.534]
६	वास्तुशास्त्र [Ba 537]	वास्तुशास्त्र [Bas. 538]

(इ) थप ऐच्छिक विषय

क्र. स.	कक्षा ११ का ऐच्छिक विषय र कोड	कक्षा १२ का ऐच्छिक विषय र कोड
१	मानवमूल्य शिक्षा (Human Value Education) [Hve. 131]	मानवमूल्य शिक्षा (Human Value Education) [Hve. 132]
२	कम्प्युटर विज्ञान (Computer Science) [Com. 231]	कम्प्युटर विज्ञान (Computer Science) [Com. 232]
३	अर्थशास्त्र (Economics) [Eco. 303]	अर्थशास्त्र (Economics) [Eco. 304]
४	नेपाली (Nepali) [Nep. 331]	नेपाली (Nepali) [Nep. 332]
५	अङ्ग्रेजी (English) [Eng. 333]	अङ्ग्रेजी (English) [Eng. 334]
६	गणित (Mathematics) [Mat. 401]	गणित (Mathematics) [Mat. 402]

परम्परागत शिक्षा: गोन्पा/मदर्सा

(क) अनिवार्य विषय

सि. नं.	कक्षा ११ का विषय र कोड	कक्षा १२ का विषय र कोड
१	बौद्ध शिक्षा [Bue. 021]	बौद्ध शिक्षा [Bue. 022]
२	उर्दू व्याकरण र साहित्य [Ugl. 031]	उर्दू व्याकरण र साहित्य [Ugl. 032]

द्रष्टव्य : अनिवार्य विषयहरू नेपाली [Nep. 001 र Nep. 002], अङ्ग्रेजी [Eng. 003 र Eng. 004], सामाजिक अध्ययन [Soc. 005], जीवनोपयोगी शिक्षा [Lif. 008] साधारण धारमै उल्लेख भएअनुसार हुनेछन् । विद्यार्थीले अङ्ग्रेजी [Eng. 003 र Eng. 004] को सट्टा गोन्पामा बौद्ध शिक्षा [Bue. 021 / Bue 022] र मदर्सामा उर्दू व्याकरण र साहित्य [Ugl. 031, Ugl 032] विषय अध्ययन गर्न सक्नेछन् ।

(ख) ऐच्छिक विषय

(अ) ऐच्छिक पहिलो समूह

क्र. स.	कक्षा ११ का ऐच्छिक विषय र कोड	कक्षा १२ का ऐच्छिक विषय र कोड
१	बौद्ध दर्शन [Bup.601]	बौद्ध दर्शन [Bup.602]
२	कुरान [Kur. 611]	कुरान [Kur. 612]

(आ) ऐच्छिक दोस्रो समूह

क्र. स.	कक्षा ११ का ऐच्छिक विषय र कोड	कक्षा १२ का ऐच्छिक विषय र कोड
१	कम्प्युटर विज्ञान [Com.231]	कम्प्युटर [Com. 232]
२	बौद्ध कर्मकाण्ड [Bkk. 527]	बौद्ध कर्मकाण्ड [Bkk. 628]
३	ज्योतिष [Jyo.621]	ज्योतिष [Jyo.622]
४	भैषज्य [Bha. 623]	भैषज्य [Kur. 624]
५	शिल्प विद्या [Sil. 625]	शिल्प विद्या [Sil. 626]
६	हदिस र असुले हदिस [Hah. 651]	हदिस र असुले हदिस [Hah. 652]

(इ) ऐच्छिक तेस्रो समूह

क्र. स.	कक्षा ११ का ऐच्छिक विषय र कोड	कक्षा १२ का ऐच्छिक विषय र कोड
१	संस्कृत रचना [Saw. 011]	संस्कृत रचना [Saw. 012]
२	अङ्ग्रेजी [Eng. 333]	अङ्ग्रेजी [Eng. 334]
३	चिनियाँ भाषा [Chi. 341]	चिनियाँ भाषा [Chi. 342]
४	जापानिज भाषा [Jap. 345]	जापानिज भाषा [Jap 346]
५	पाली भाषा [Pal. 631]	पाली भाषा [Pal. 632]
६	भोट भाषा [Bht. 633]	भोट भाषा [Bht. 634]
७	मिरास विज्ञान [Mir. 661]	मिरास विज्ञान [Mir.662]

७. पठनपाठनको समयावधि

१. प्रारम्भिक बालविकास तथा शिक्षाका लागि एक शैक्षिक सत्रमा वार्षिक जम्मा ५७६ घण्टा दैनिक सिप सिकाइ क्रियाकलाप र विषयगत सिप सिकाइ क्रियाकलाप सञ्चालन हुने छ । यसै गरी वार्षिक २५६ घण्टासम्म मनोरञ्जन, बाह्य खेल र आराम गर्ने तथा खाजा खाने समय हुने छ । उक्त समयले बालबालिकाले प्रारम्भिक बालविकास केन्द्रमा बिताउने पूरा अवधिलाई बुझाउँछ ।

२. विद्यालय शिक्षाको सबै कक्षाका लागि एक शैक्षिक वर्षमा कम्तीमा २०५ दिन पठनपाठन सञ्चालन हुने छ ।

३. कक्षा १ देखि ३ सम्म जम्मा २६ पाठ्यघण्टा अर्थात् वार्षिक ८३२ कार्यघण्टाको पठनपाठन गर्नुपर्ने छ ।

४. कक्षा ४ देखि १० सम्म जम्मा ३२ पाठ्यघण्टा अर्थात् वार्षिक १०२४ कार्यघण्टा र कक्षा ११ र १२ मा कम्तीमा २७ पाठ्यघण्टा अर्थात् ८६४ कार्यघण्टादेखि बढीमा ३२ पाठ्यघण्टा अर्थात् १०२४ कार्यघण्टा पठनपाठन गर्नुपर्ने छ ।

५. पठनपाठन सञ्चालनका लागि खर्च भएको ३२ घण्टाको समयावधिलाई १ पाठ्यघण्टा मानिने छ ।

६. सामान्यतया प्रतिदिन प्रतिविषय एक घण्टाको एक पिरियड हुने छ । तर तोकिएको पाठ्यघण्टा (Credit hour) नघट्ने गरी विद्यालयले विषयको आवश्यकताअनुसार साप्ताहिक कार्यतालिकाको समयावधि निर्धारण गरी कक्षा सञ्चालन गर्नुपर्ने छ ।

८. सिकाइ सहजीकरण प्रक्रिया

१. माध्यमिक शिक्षामा शिक्षण सिकाइ क्रियाकलाप सञ्चालन गर्दा विद्यार्थी केन्द्रित र बालमैत्री शिक्षण विधि अपनाउनुपर्ने छ । विद्यार्थीको सहभागितामा योजना निर्माण, परियोजना कार्य, क्षेत्र भ्रमण, समस्या समाधान, खोजमूलक अध्ययन, प्रवर्तनमुखी शिक्षण पद्धतिलाई शिक्षण सिकाइका विधिका रूपमा कार्यान्वयन गर्नुपर्ने छ । विद्यार्थीको सिकाइलाई केन्दबिन्दु मानी शिक्षण सिकाइ क्रियाकलाप सञ्चालन गर्नुपर्ने छ । सबै प्रकारका सिकाइ आवश्यकता र चाहना भएका (अपाङ्ग, अशक्त, असहाय, कमजोर आदि) विद्यार्थीलाई समेट्ने गरी कक्षामा समावेशी शिक्षण प्रक्रिया अपनाउनुपर्ने छ । साधारण, गुरुकुल, गोन्पा (गुम्बा) तथा विहार र मदर्सा शिक्षाका पठन पाठनमा आवश्यकताअनुसार कम्प्युटर प्रविधिको पनि उपयोग गर्न सकिने छ । यसका लागि शिक्षकले सहजकर्ता, उत्प्रेरक, प्रवर्धक र खोजकर्ताका रूपमा भूमिका निर्वाह गर्नुपर्ने छ ।

२. विद्यार्थीको सिकाइलाई केन्द्रबिन्दु मानी सिकाइ सहजीकरण क्रियाकलाप सञ्चालन गर्नुपर्ने छ । विद्यार्थीको सहभागितामा योजना निर्माण, परियोजना तथा प्रयोगात्मक कार्य, क्षेत्र भ्रमण, समस्या समाधान, आविष्कारमुखी अध्ययन, प्रवर्तनमुखी शिक्षण पद्धतिलाई सिकाइ सहजीकरण विधिका रूपमा कार्यान्वयन गर्नुपर्ने छ ।

३. सिकाइ प्रक्रिया सैद्धान्तिक पक्षमा भन्दा बढी गरेर सिक्ने अवसर प्रदान गर्ने क्रियाकलापमा आधारित हुनुपर्ने छ ।

४. शिक्षकले सहजकर्ता, उत्प्रेरक, प्रवर्धक र खोजकर्ताका रूपमा भूमिका निर्वाह गर्नुपर्ने छ ।

५. पठनपाठनमा सूचना तथा सञ्चार प्रविधिलाई उपलब्ध साधन, स्रोत र आवश्यकताअनुसार उपयोग गर्नुपर्ने छ ।

६. सबै प्रकारका सिकाइ आवश्यकता र चाहना भएका (अपाङ्गता भएका, अशक्त, असहाय, कमजोर आदि) विद्यार्थीलाई समेट्ने गरी कक्षामा समावेशी सिकाइ सहजीकरण प्रक्रिया अपनाउनुपर्ने छ ।

९. विषय छनोट प्रक्रिया

१. साधारणतर्फ कक्षा ११ र १२ मा ऐच्छिक विषय छनोट गर्दा निर्धारित चार समूहमध्ये कुनै तीन समूहबाट एक एकओटा पर्ने गरी ऐच्छिक विषय छनोट गर्नुपर्ने छ । विद्यार्थीले अध्ययन गर्न चाहेमा ऐच्छिक विषय छनोट नगरेको समूहबाट एक थप ऐच्छिक विषय अध्ययन गर्न सक्ने छन् । विद्यार्थीको रुचि तथा भावी अध्ययनलाई समेत आधार मानी विद्यालयले थप ऐच्छिक विषयको पठनपाठनको व्यवस्था गर्नुपर्ने छ ।

२. कक्षा ११ र १२ दुवैमा भौतिक विज्ञान, रासायनिक विज्ञान र जीव विज्ञान तीनओटै विषय अध्ययन गर्ने विद्यार्थीहरूले चाहेमा थप ऐच्छिक विषयका रूपमा गणित विषय अध्ययन गर्न पाउने छन् ।

३. प्राविधिक तथा व्यावसायिक धार तथा परम्परागत धारतर्फ विषयको छनोटका आधार सम्बन्धित पाठ्यक्रम संरचना तथा ऐच्छिक विषयका सूचीमा समावेश गरिएअनुसार हुने छ ।

४. कक्षा ११ र १२ मा ऐच्छिक विषय छनोट गर्दा कक्षा ११ र १२ मा एकै विषय वा फरक फरक विषय पनि छनोट गर्न सकिने छ । तर कक्षा ११ र १२ मा फरक फरक विषय छनोट गर्दा पाठ्यक्रम विकास केन्द्रले तयार गरेको विषय छनोट मार्गदर्शनलाई आधार मान्नुपर्ने छ ।

१०. विद्यार्थी मूल्याङ्कन प्रक्रिया

विद्यालय तहमा विद्यार्थी उपलब्धि मूल्याङ्कनका लागि निर्माणात्मक मूल्याङ्कन प्रक्रिया अवलम्बन गरी सिकाइ सुधारका लागि निरन्तर पृष्ठपोषण प्रदान गरिनुका साथै निर्णयात्मक मूल्याङ्कन प्रक्रियालाई अवलम्बन गरी विद्यार्थीको सिकाइस्तर निर्धारण गर्नुपर्छ ।

(क) निर्माणात्मक मूल्याङ्कन : निर्माणात्मक मूल्याङ्कनको मुख्य उद्देश्य विद्यार्थीहरूको सिकाइ स्तरमा सुधार गर्नु हो । यसका लागि शिक्षकले विद्यार्थीको व्यक्तिगत सिकाइ उपलब्धिका आधारमा पटक पटक सिकाइ अवसर प्रदान गर्नुपर्ने छ । विद्यालय तहको निर्माणात्मक मूल्याङ्कनमा कक्षागत सिकाइ सहजीकरणको अभिन्न अङ्गका रूपमा गृहकार्य, कक्षाकार्य, प्रयोगात्मक तथा परियोजना कार्य, सामुदायिक कार्य, अतिरिक्त क्रियाकलाप, एकाइ परीक्षा, मासिक तथा त्रैमासिक परीक्षा जस्ता मूल्याङ्कनका साधनहरूको प्रयोग गर्न सकिने छ । यस्तो

मूल्याङ्कनमा विद्यार्थीको अभिलेख राखी सिकाइ अवस्था यकिन गरी सुधारात्मक तथा उपचारात्मक सिकाइबाट सुधार गर्ने पक्षमा जोड दिइने छ । विशेष सिकाइ आवश्यकता भएका विद्यार्थीका लागि विषय शिक्षकले नै उपयुक्त प्रक्रिया अपनाई मूल्याङ्कन गर्नुपर्ने छ ।

निर्माणात्मक मूल्याङ्कनको नतिजालाई अभिलेखीकरण गरी विषयगत पाठ्यक्रममा तोकिएअनुसार निश्चित भार आन्तरिक मूल्याङ्कनका रूपमा निर्णयात्मक मूल्याङ्कनमा समावेश गरिने छ ।

(ख) निर्णयात्मक मूल्याङ्कन : माध्यमिक तहमा निम्नानुसार निर्णयात्मक मूल्याङ्कन गर्नुपर्ने छ :

(अ) निर्माणात्मक मूल्याङ्कनबाट प्राप्त नतिजाका आधारमा आन्तरिक मूल्याङ्कनको र अन्तिम/बाह्य परीक्षाको नतिजाका आधारमा तोकिएको भार समावेश गरी विद्यार्थीको निर्णयात्मक मूल्याङ्कन गरिने छ ।

(आ) आन्तरिक मूल्याङ्कनका रूपमा निर्माणात्मक मूल्याङ्कनबाट प्राप्त निम्नअनुसार तोकिएअनुसारको भारको मूल्याङ्कन निर्णयात्मक मूल्याङ्कनमा समावेश गरिने छ । आन्तरिक मूल्याङ्कनका तरिकामा विषयगत विविधता हुन सक्ने भए पनि निम्नलिखित पक्षको मूल्याङ्कन सबै विषयमा समावेश हुने छ :

- **कक्षा सहभागिताको मूल्याङ्कन :** विद्यार्थीको नियमितता (उपस्थिति) र कक्षा क्रियाकलापमा सहभागिताको अभिलेखका आधारमा गरिएको मूल्याङ्कन ।
- **त्रैमासिक परीक्षाहरूका अङ्कका आधारमा प्राप्त अङ्क :** पहिलो त्रैमासिक अवधिभरमा पठनपाठन भएका विषयवस्तुबाट पहिलो परीक्षा सञ्चालन गरिने छ भने पहिलो र दोस्रो त्रैमासिक अवधिभरमा पठनपाठन भएका विषयवस्तुबाट दोस्रो त्रैमासिक परीक्षा सञ्चालन गरिने छ ।
- **प्रयोगात्मक तथा परियोजना कार्यको मूल्याङ्कन**
- **विषयगत पाठ्यक्रममा तोकिएअनुसारका अन्य आधारहरू**

(इ) कक्षा ११ र १२ मा विषयगत पाठ्यक्रममा तोकिएअनुसारको भारको बाह्य सार्वजनिक परीक्षा हुने छ । बाह्य परीक्षा सैद्धान्तिक वा सैद्धान्तिक र प्रयोगात्मक दुवै हुन सक्ने छ ।

(ई) प्रयोगात्मक, सैद्धान्तिक तथा अन्य पक्षको मूल्याङ्कनको भार, विधि तथा साधन सम्बन्धित विषयको पाठ्यक्रममा उल्लेख भएअनुसार हुनुपर्ने छ । सैद्धान्तिक पक्षको मूल्याङ्कनका लागि विशिष्टीकरण तालिका निर्माण गरिने छ ।

(उ) परीक्षामा विशेष सिकाइ आवश्यकता भएका विद्यार्थीहरूलाई केही खास खास विषयहरूमा अरू साधारण विद्यार्थीहरूलाई दिइने प्रश्नभन्दा अलग प्रश्न बनाई मूल्याङ्कन गर्नुपर्ने छ । विशेष आवश्यकता भएका विद्यार्थीका लागि परीक्षाको समय थप गर्न सकिने छ । विद्यार्थी मूल्याङ्कन गर्दा शिक्षकले अपाङ्गता भएका र विशेष सिकाइ आवश्यकता भएका विद्यार्थीहरूका लागि उपयुक्त हुने मूल्याङ्कन प्रक्रिया अपनाउनुपर्ने छ ।

द्रष्टव्य : विद्यार्थीको स्तर निर्धारण (Grading) को विधि तथा प्रक्रियाका लागि पाठ्यक्रम विकास केन्द्रले छुट्टै निर्देशिका तयार गर्नेछ ।

११. शिक्षाको माध्यम

माध्यमिक शिक्षा कक्षा ११ र १२ मा शिक्षणको माध्यम भाषा सामान्यतया नेपाली भाषा हुने छ । तर देहायको अवस्थामा विद्यालयमा शिक्षाको माध्यम देहायबमोजिम हुने छ :

(क) भाषा विषय अध्ययन गराउँदा शिक्षाको माध्यम सोही भाषा हुने छ ।

(ख) सामाजिक अध्ययन र मानवमूल्य शिक्षा वा चारित्रिक शिक्षालगायत नेपाली कला, संस्कृति र मौलिक पहिचानमूलक विषयवस्तुहरूबाहेक अन्य विषयहरूमा पठनपाठनका लागि माध्यम भाषा अङ्ग्रेजी पनि प्रयोग गर्न सकिने छ ।

(ग) संस्कृत तथा परम्परागत धारतर्फका शास्त्रीय विषयहरूको पाठ्यसामग्री र पठनपाठनको माध्यम सम्बन्धित भाषा हुने छ । धार्मिक प्रकृतिका विषयहरूको पठनपाठन सम्बन्धित धार्मिक ग्रन्थ लेखिएको भाषामा नै गर्न सकिने छ ।

(घ) गैरनेपाली नागरिकले नेपालका विद्यालयमा अध्ययन गर्दा नेपाली विषयको सट्टा अन्य कुनै भाषाको विषय अध्ययन गर्न सक्ने व्यवस्था मिलाउन सकिने छ ।

१२. पाठ्यक्रम मूल्याङ्कन

पाठ्यक्रमको मूल्याङ्कनका आधार निम्नानुसार हुने छन् :

(क) विद्यार्थीको उपलब्धि स्तर

(ख) शिक्षकको कार्य सम्पादन स्तर

(ग) पठन पाठनमा उपयोग गरिएको समय

(घ) विद्यार्थीको वैयक्तिक तथा सामाजिक व्यवहार र प्रभाव

(ङ) अभिभावक तथा समाजको सिकाइप्रतिको अपेक्षा र प्रतिक्रिया

(च) सरोकारवालाको विद्यालयप्रतिको धारणा

उपर्युक्त पक्षमा समेतका आधारमा प्रत्येक पाँच वर्षमा पाठ्यक्रमको मूल्याङ्कन गरिने छ । यसो गर्दा व्यक्ति, परिवार र समाजमा परेको प्रभाव समेतलाई हेरिने छ ।

१३. पाठ्यक्रम कार्यान्वयन योजना

राष्ट्रिय पाठ्यक्रम प्रारूप, २०७६ का सिद्धान्त तथा मार्गदर्शनमा आधारित भई विकास गरिएका विद्यालय तहका पाठ्यक्रमहरू निम्नअनुसार परीक्षण तथा कार्यान्वयन हुनेछन् :

पाठ्यक्रम परीक्षण तथा कार्यान्वयन योजना

कक्षा	शैक्षिक वर्ष २०७६	शैक्षिक वर्ष २०७७	शैक्षिक वर्ष २०७८	शैक्षिक वर्ष २०७९	शैक्षिक वर्ष २०८०
१	परीक्षण	कार्यान्वयन			
२		परीक्षण	कार्यान्वयन		
३		परीक्षण	कार्यान्वयन		
४			परीक्षण	कार्यान्वयन	
५				परीक्षण	कार्यान्वयन
६		परीक्षण	कार्यान्वयन		
७			परीक्षण	कार्यान्वयन	
८					कार्यान्वयन
९			परीक्षण	कार्यान्वयन	
१०					कार्यान्वयन
११		कार्यान्वयन			
१२			कार्यान्वयन		

खण्ड ख

माध्यमिक शिक्षा पाठ्यक्रम (कक्षा ११ र १२), २०७६ : ऐच्छिक विषय (चौथो समूह)का पाठ्यक्रम

यस खण्डमा ऐच्छिक चौथो समूहअन्तर्गतका विषयका विषयगत पाठ्यक्रम समावेश गरिएको छ । प्रत्येक विषयगत पाठ्यक्रममा परिचय, तहगत सक्षमता, कक्षागत सिकाइ उपलब्धि, विषयवस्तुको क्षेत्र र क्रम, प्रयोगात्मक तथा परियोजना कार्यअन्तर्गतका सम्भाव्य क्रियाकलापका उदाहरण, क्षेत्र वा एकाइगत कार्यघण्टा, विद्यार्थी मूल्याङ्कन विधि तथा प्रक्रिया उल्लेख गरिएको छ ।

Secondary Education Curriculum
2076
Maths

Grades: 11 and 12 **Subject code:** Mat. 401 **(Grade 11),**
Mat. 402 **(Grade 12)**

Credit hrs: 5 **Working hrs: 160**

1. Introduction

Mathematics is an indispensable in many fields. It is essential in the field of engineering, medicine, natural sciences, finance and other social sciences. The branch of mathematics concerned with application of mathematical knowledge to other fields and inspires new mathematical discoveries. The new discoveries in mathematics led to the development of entirely new mathematical disciplines. School mathematics is necessary as the backbone for higher study in different disciplines. Mathematics curriculum at secondary level is the extension of mathematics curriculum offered in lower grades (1 to 10).

This course of Mathematics is designed for grade 11 and 12 students as an optional subject as per the curriculum structure prescribed by the National Curriculum Framework, 2075. This course will be delivered using both the conceptual and theoretical inputs through demonstration and presentation, discussion, and group works as well as practical and project works in the real world context. Calculation strategies and problem solving skills will be an integral part of the delivery.

This course includes different contents like; Algebra, Trigonometry, Analytic Geometry, Vectors, Statistics and Probability, Calculus, Computational Methods and Mechanics or Mathematics for Economics and Finance.

Student's content knowledge in different sectors of mathematics with higher understanding is possible only with appropriate pedagogical skills of their teachers. So, classroom teaching must be based on student-centered approaches like project work, problem solving etc.

2. Level-wise Competencies

On completion of this course, students will have the following competencies:

1. apply numerical methods to solve algebraic equation and calculate definite integrals and use simplex method to solve linear programming problems (LPP).
2. use principles of elementary logic to find the validity of statement.
3. make connections and present the relationships between abstract algebraic structures with familiar number systems such as the integers and real numbers.
4. use basic properties of elementary functions and their inverse including linear, quadratic, reciprocal, polynomial, rational, absolute value, exponential, logarithm, sine, cosine and tangent functions.
5. identify and derive equations or graphs for lines, circles, parabolas, ellipses, and hyperbolas,
6. use relative motion, Newton's laws of motion in solving related problems.

7. articulate personal values of statistics and probability in everyday life.
8. apply derivatives to determine the nature of the function and determine the maxima and minima of a function and normal increasing and decreasing function into context of daily life.
9. explain anti-derivatives as an inverse process of derivative and use them in various situations.
10. use vectors and mechanics in day to day life.
11. develop proficiency in application of mathematics in economics and finance.

3. Grade-wise Learning Outcomes

On completion of the course, the students will be able to:

S. N.	Content Domain/area	Learning Outcomes	
		Grade 11	**Grade 12**
1.	**Algebra**	1.1 acquaint with logical connectives and use them. 1.2 construct truth tables. 1.3 prove set identities. 1.4 state field axioms, order axioms of real numbers. 1.5 define interval and absolute value of real numbers. 1.6 interpret real numbers geometrically. 1.7 define ordered pair, Cartesian product, domain and range of relation, inverse of relation and solve the related problems. 1.8 define domain and range of a function, inverse function composite function. 1.9 find domain and range of a function. 1.10 find inverse function of given invertible function. 1.11 calculate composite function of given functions. 1.12 define odd and even functions, periodicity of a function, monotonicity of a function. 1.13 sketch graphs of polynomial	1.1 solve the problems related to permutation and combinations. 1.2 state and prove binomial theorems for positive integral index. 1.3 state binomial theorem for any index (without proof). 1.4 find the general term and binomial coefficient. 1.5 use binomial theorem in application to approximation. 1.6 define Euler's number. 1.7 Expand ex, ax and log(1+x) using binomial theorem. 1.8 define binary operation and apply binary operation on sets of integers. 1.9 state properties of binary operations. 1.10 define group, finite group, infinite group and abelian group. 1.11 prove the uniqueness of identity, uniqueness of inverse, cancelation law. 1.12 state and prove De Moivre's theorem.

		functions ($eg: \frac{a}{x}, \frac{x^2-a^2}{x-a}, \frac{a}{x+a}, ax^2 + bx + c, ax^3$), trigonometric, exponential, logarithmic functions. 1.14 define sequence and series. 1.15 classify sequences and series (arithmetic, geometric, harmonic). 1.16 solve the problems related to arithmetic, geometric and harmonic sequences and series. 1.17 establish relation among A.M, G. M and H.M. 1.18 find the sum of infinite geometric series. 1.19 obtain transpose of matrix and verify its properties. 1.20 calculate minors, cofactors, adjoint, determinant and inverse of a square matrix. 1.21 solve the problems using properties of determinants. 1.22 define a complex number. 1.23 solve the problems related to algebra of complex numbers. 1.24 represent complex number geometrically. 1.25 find conjugate and absolute value (modulus) of a complex numbers and verify their properties. 1.26 find square root of a complex number. 1.27 express complex number in polar form.	1.13 find the roots of a complex number by De Moivre's theorem. 1.14 solve the problems using properties of cube roots of unity. 1.15 apply Euler's formula. 1.16 define polynomial function and polynomial equation. 1.17 state and apply fundamental theorem of algebra (without proof). 1.18 find roots of a quadratic equation. 1.19 establish the relation between roots and coefficient of quadratic equation. 1.20 form a quadratic equation with given roots. 1.21 sum of finite natural numbers, sum of squares of first n-natural numbers, sum of cubes of first n-natural numbers, intuition and induction, principle of mathematical induction. 1.22 using principle of mathematical induction, find the sum of finite natural numbers, sum of squares of first n-natural numbers, sum of cubes of first n-natural numbers. 1.23 solve system of linear equations by Cramer's rule and matrix method (row-equivalent and inverse) up to three variables.
2.	**Trigonometry**	2.1 solve the problems using properties of a triangle (sine law, cosine law, tangent law, projection laws, half angle laws).	2.1 define inverse circular functions. establish the relations on inverse circular functions.

		2.2 solve the triangle(simple cases)	2.2 find the general solution of trigonometric equations
3.	**Analytic geometry**	3.1 find the length of perpendicular from a given point to a given line. 3.2 find the equation of bisectors of the angles between two straight lines. 3.3 write the condition of general equation of second degree in x and y to represent a pair of straight lines. 3.4 find angle between pair of lines and bisectors of the angles between pair of lines given by homogenous second degree equation in x and y. 3.5 solve the problems related to condition of tangency of a line at a point to the circle. 3.6 find the equations of tangent and normal to a circle at given point. 3.7 find the standard equation of parabola. 3.8 find the equations of tangent and normal to a parabola at given point.	3.1 obtain standard equation of ellipse and hyperbola. 3.2 find direction ratios and direction cosines of a line. 3.3 find the general equation of a plane. 3.4 find equation of a plane in intercept and normal form. 3.5 find the equation of plane through three given points. 3.6 find the equation of geometric plane through the intersection of two given planes. 3.7 find angle between two geometric planes. 3.8 write the conditions of parallel and perpendicular planes. 3.9 find the distance of a point from a plane.
4.	**Vectors**	4.1 identify collinear and non-collinear vectors; coplanar and non-coplanar vectors. 4.2 write linear combination of vectors. 4.3 find scalar product of two vectors. 4.4 find angle between two vectors. 4.5 interpret scalar product of vectors geometrically. 4.6 apply properties of scalar product of vectors in trigonometry and geometry.	4.1 define vector product of two vectors, interpretation vector product geometrically. 4.2 solve the problems using properties of vector product. 4.3 apply vector product in plane trigonometry and geometry.
5.	**Statistics and**	5.1 calculate the measures of	5.1 calculate correlation coefficient

	Probability	dispersion (standard deviation). 5.2 calculate variance, coefficient of variation and coefficient of skewness. 5.3 define random experiment, sample space, event, equally likely cases, mutually exclusive events, exhaustive cases, favorable cases, independent and dependent events. 5.4 find the probability using two basic laws of probability.	by Karl Pearson's method. 5.2 calculate rank correlation coefficient by Spearman method. 5.3 interpret correlation coefficient. 5.4 obtain regression line of y on x and x on y. 5.5 solve the simple problems of probability using combinations. 5.6 solve the problems related to conditional probability. 5.7 use binomial distribution and calculate mean and standard deviation of binomial distribution.
6.	**Calculus**	6.1 define limits of a function. 6.2 identify indeterminate forms. 6.3 apply algebraic properties of limits. 6.4 evaluate limits by using theorems on limits of algebraic, trigonometric, exponential and logarithmic functions. 6.5 define and test continuity of a function. 6.6 define and classify discontinuity. 6.7 interpret derivatives geometrically. 6.8 find the derivatives, derivative of a function by first principle (algebraic, trigonometric exponential and logarithmic functions). 6.9 find the derivatives by using rules of differentiation (sum, difference, constant multiple, chain rule, product rule, quotient rule, power and general power rules).	6.1 find the derivatives of inverse trigonometric, exponential and logarithmic functions by definition. 6.2 establish the relationship between continuity and differentiability. 6.3 differentiate the hyperbolic function and inverse hyperbolic function 6.4 evaluate the limits by L'hospital's rule (for 0/0, ∞/∞). 6.5 find the tangent and normal by using derivatives. 6.6 interpret geometrically and verify Rolle's theorem and Mean Value theorem. 6.7 find the anti-derivatives of standard integrals, integrals reducible to standard forms and rational function (using partial fractions also). 6.8 solve the differential equation of first order and first degree by separable variables, homogenous, linear and exact

		6.10 find the derivatives of parametric and implicit functions. 6.11 calculate higher order derivatives. 6.12 check the monotonicity of a function using derivative. 6.13 find extreme values of a function. 6.14 find the concavity of function by using derivative. 6.15 define integration as reverse of differentiation. 6.16 evaluate the integral using basic integrals. 6.17 integrate by substitution and by integration by parts method. 6.18 evaluate the definite integral. 6.19 find area between two curves.	differential equation.
7.	**Computational methods**	7.1 tell the basic idea of characteristics of numerical computing, accuracy, rate of convergence, numerical stability, efficiency). 7.2 approximate error in computing roots of non-linear equation. 7.3 solve algebraic polynomial and transcendental equations by bisection method	7.1 solve algebraic polynomial and transcendental equations by Newton-Raphson methods. 7.2 solve the linear programming problems (LPP) by simplex method of two variables. 7.3 integrate numerically by trapezoidal and Simpson's rules and estimate the errors.
8.	**Mechanics**	8.1 find resultant forces by parallelogram of forces. 8.2 solve the problems related to composition and resolution of forces. 8.3 obtain resultant of coplanar forces/vectors acting on a point. 8.4 solve the forces/vectors related problems using Lami's theorem. 8.5 solve the problems of motion of particle in a straight line, motion with uniform acceleration,	8.1 find the resultant of like and unlike parallel forces/vectors. 8.2 solve the problems related to Newton's laws of motion and projectile.

	Or **Mathematics for Economics and Finance**	motion under the gravity, motion in a smooth inclined plane. Or	Or
		8.1 interpret results in the context of original real- world problems. 8.2 test how well it describes the original real- world problem and how well it describes past and/or with what accuracy it predicts future behavior. 8.3 Model using demand and supply function. 8.4 Find cost, revenue, and profit functions. 8.5 Compute elasticity of demands. 8.6 Construct mathematical models involving supply and income, budget and cost constraint. 8.7 Test the equilibrium and break even condition.	8.1 use quadratic functions in economics, 8.2 understand input- output analysis and dynamics of market price. 8.3 find difference equations. 8.4 work with Cobweb model and lagged Keynesian macroeconomic model. 8.5 explain mathematically equilibrium and break-even. 8.6 construct mathematical models involving consumer and producer surplus. 8.7 use quadratic functions in economics. 8.8 do input- output analysis. 8.9 analyze dynamics of market. 8.10 construct difference equations, 8.11 understand cobweb model, lagged Keynesian macroeconomics model.

4. Scope and Sequence of Contents

S.N.	Content area	Grade 11		Grade 12	
		Contents	**Working hrs**		**Working hrs**
1	**Algebra**	**1.1 Logic and Set**: introduction of Logic, statements, logical connectives, truth tables, basic laws of logic, theorems based on set operations. **1.2 Real numbers: field axioms, order**	32	**1.1 Permutation and combination**: Basic principle of counting, Permutation of (a) set of objects all different (b) set of objects not all different (c) circular arrangement (d) repeated use of the same objects. Combination of	32

		axioms, interval, absolute value, geometric representation of real numbers. **1.3 Function**: Review, domain & range of a function, Inverse function, composite function, functions of special type, algebraic (linear, quadratic & cubic), Trigonometric, exponential, logarithmic) **1.4 Curve sketching**: odd and even functions, periodicity of a function, symmetry (about origin, x-and y-axis), monotonicity of a function, sketching graphs of polynomials and some rational functions $(\frac{a}{x}, \frac{x^2-a^2}{x-a}, \frac{a}{x+a}, ax^2+bx+c, ax^3)$, Trigonometric, exponential, logarithmic function (simple cases only) **1.5 Sequence and series:** arithmetic, geometric, harmonic sequences and series and their properties A.M, G.M, H.M and their relations, sum of infinite geometric series. **1.6 Matrices and determinants:** Transpose of a matrix and its properties,		things all different, Properties of combination **1.2 Binomial Theorem:** Binomial theorem for a positive integral index, general term. Binomial coefficient, Binomial theorem for any index (without proof), application to approximation. Euler's number. Expansion of e^x, a^x and log(1+x) (without proof) **1.3 Elementary Group Theory**: Binary operation, Binary operation on sets of integers and their properties, Definition of a group, Finite and infinite groups. Uniqueness of identity, Uniqueness of inverse, Cancelation law, Abelian group. **1.4 Complex numbers:** De Moivre's theorem and its application in finding the roots of a complex number, properties of cube roots of unity. Euler's formula. **1.5 Quadratic equation**: Nature and roots of a quadratic equation, Relation between roots and coefficient. Formation of a quadratic equation, Symmetric roots, one or both roots common. **1.6 Mathematical induction**: Sum of finite natural numbers, sum of squares of first n-natural numbers, Sum of cubes of first n- natural numbers, Intuition and induction, principle of mathematical induction. **1.7 Matrix based system of linear equation**: Consistency of system of linear equations, Solution of	

		Minors and cofactors, Adjoint, Inverse matrix, Determinant of a square matrix, Properties of determinants (without proof) **1.7 Complex number:** definition imaginary unit, algebra of complex numbers, geometric representation, absolute value (Modulus) and conjugate of a complex numbers and their properties, square root of a complex number, polar form of complex numbers.		a system of linear equations by Cramer's rule. Matrix method (row- equivalent and Inverse) up to three variables.	
2	**Trigonometry**	2.1 Properties of a triangle (Sine law, Cosine law, tangent law, Projection laws, Half angle laws). 2.2 Solution of triangle(simple cases)	8	2.1 Inverse circular functions. 2.2 Trigonometric equations and general values	8
3	**Analytic Geometry**	**3.1 Straight Line**: length of perpendicular from a given point to a given line. Bisectors of the angles between two straight lines. **Pair of straight lines**: General equation of second degree in x and y, condition for representing a pair of lines. Homogenous second-degree equation in x and y. angle between pair of lines. Bisectors of the angles between pair of	14	**3.1 Conic section:** Standard equations of Ellipse and hyperbola. **3.2 Coordinates in space**: direction cosines and ratios of a line general equation of a plane, equation of a plane in intercept and normal form, plane through 3 given points, plane through the intersection of two given planes, parallel and perpendicular planes, angle between two planes, distance of a point from a plane.	14

		lines. **3.2 Circle**: Condition of tangency of a line at a point to the circle, Tangent and normal to a circle. **3.3 Conic section**: Standard equation of parabola, equations of tangent and normal to a parabola at a given point.			
4	**Vectors**	**4.1 Vectors:** collinear and non collinear vectors, coplanar and non-coplanar vectors, linear combination of vectors, **4.2 Product of vectors:** scalar product of two vectors, angle between two vectors, geometric interpretation of scalar product, properties of scalar product, condition of perpendicularity.	8	**4.1 Product of Vectors:** vector product of two vectors, geometrical interpretation of vector product, properties of vector product, application of vector product in plane trigonometry. **4.2 Scalar triple Product**: introduction of scalar triple product	8
5	**Statistics & Probability**	**5.1 Measure of Dispersion:** introduction, standard deviation), variance, coefficient of variation, Skewness (Karl Pearson and Bowley) **5.2 Probability:** independent cases, mathematical and empirical definition of probability, two basic laws of probability(without proof).	10	**5.1 Correlation and Regression**: correlation, nature of correlation, correlation coefficient by Karl Pearson's method, interpretation of correlation coefficient, properties of correlation coefficient (without proof), rank correlation by Spearman, regression equation, regression line of y on x and x on y. **5.2 Probability**: Dependent cases, conditional probability (without proof), binomial distribution, mean and standard deviation of	10

				binomial distribution (without proof).	
6	**Calculus**	**6.1 Limits and continuity**: limits of a function, indeterminate forms. algebraic properties of limits (without proof), Basic theorems on limits of algebraic, trigonometric, exponential and logarithmic functions, continuity of a function, types of discontinuity, graphs of discontinuous function. **6.2 Derivatives:** derivative of a function, derivatives of algebraic, trigonometric, exponential and logarithmic functions by definition (simple forms), rules of differentiation. derivatives of parametric and implicit functions, higher order derivatives, geometric interpretation of derivative, monotonicity of a function, interval of monotonicity, extreme of a function, concavity, points of inflection, derivative as rate of measure. **6.3 Anti-derivatives:** anti-derivative. integration using basic integrals, integration by substitution and by	32	**6.1 Derivatives:** derivative of inverse trigonometric, exponential and logarithmic function by definition, relationship between continuity and differentiability, rules for differentiating hyperbolic function and inverse hyperbolic function, L'Hospital's rule (0/0, ∞/∞), differentials, tangent and normal, geometrical interpretation and application of Rolle's theorem and mean value theorem. **6.2 Anti-derivatives:** anti-derivatives, standard integrals, integrals reducible to standard forms, integrals of rational function. **6.3 Differential equations**: differential equation and its order, degree, differential equations of first order and first degree, differential equations with separable variables, homogenous, linear and exact differential equations.	32

		parts methods, the definite integral, the definite integral as an area under the given curve, area between two curves.			
7	**Computational Methods**	**7.1 Linear programming Problems**: linear programming problems(LPP), solution of LPP by simplex method (two variables) **7.2 Numerical computation** Characteristics of numerical computation, accuracy, rate of convergence, numerical stability, efficiency	10	**7.1 Computing Roots:** Approximation & error in computation of roots in non-linear equation, Algebraic and transcendental equations & their solution by bisection and Newton- Raphson Methods **7.2 System of linear equations:** Gauss elimination method, Gauss- Seidal method, Ill conditioned systems. **7.3 Numerical integration** Trapezoidal and Simpson's rules, estimation of errors.	10
8	**Mechanics** **Or** **Mathematics for Economics and Finance**	**8.1 Statics:** Forces and resultant forces, parallelogram law of forces, composition and resolution of forces, Resultant of coplanar forces acting on a point, Triangle law of forces and Lami's theorem. **8.2 Dynamics:** Motion of particle in a straight line, Motion with uniform acceleration, motion under the gravity, motion down a smooth inclined plane. The concepts and theorem restated and formulated as application of calculus **8.3 Mathematics for economics and finance:**	12	**8.1 Statics**: Resultant of like and unlike parallel forces. **8.2 Dynamics:** Newton's laws of motion and projectile. **8.3 Mathematics for economics and finance:** Consumer and Producer Surplus, Quadratic functions in Economics, Input-Output analysis, Dynamics of market price, Difference equations, The Cobweb model, Lagged Keynesian macroeconomic model.	12

		Mathematical Models and Functions, Demand and supply, Cost, Revenue, and profit functions, Elasticity of demand, supply and income , Budget and Cost Constraints, Equilibrium and break even			
Total			**126**		**126**

5. Practical and project activities

The students are required to do different practical activities in different content areas and the teachers should plan in the same way. Total of 34 working hours is allocated for practical and project activities in each of the grades 11 and 12. The following table shows estimated working hours for practical activities in different content areas of grade 11 and 12

S. No.	Content area/domain	Working hrs in each of the grades 11 and 12
1.	Algebra	10
2.	Trigonometry	2
3.	Analytic geometry	4
4.	Vectors	2
5.	Statistics & Probability	2
6.	Calculus	10
7.	Computational methods	2
8.	Mechanics or Mathematics for Economics and Finance	2
	Total	**34**

Here are some sample (examples) of practical and project activities.

Sample project works/mathematical activities for grade 11

1. Take a square of arbitrary measure assuming its area is one square unit. Divide it in to four equal parts and shade one of them. Again take one not shaded part of that square and

shade one fourth of it. Repeat the same process continuously and find the area of the shaded region.

2. Write two simple statements related to mathematics and write four compound statements by using them.
3. Prepare a model to illustrate the values of sine function and cosine function for different angles which are multiples of $\frac{\pi}{2}$ and π.
4. Verify the sine law by taking particular triangle in four quadrants.
5. Prepare a concrete material to show parabola by using thread and nail in wooden panel.
6. Verify that the equation of a line passing through the point of intersection of two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is of the form $(a_1x + b_1y + c_1) + K(a_2x + b_2y + c_2) = 0$.
7. Prepare a model and verify that angle in a semi-circle is a right angle by using vector method.
8. Geometrically interpret the scalar product of two vectors.
9. Collect the scores of grade 10 students in mathematics and English from your school.
    a. Make separate frequency distribution with class size 10.
    b. Which subject has more uniform/consistent result?
    c. Make the group report and present.
10. Roll two dices simultaneously 20 times and list all outcomes. Write the events that the sum of numbers on the top of both dice is a) even b) odd in all above list. Examine either they are mutually exclusive or not. Also find the probabilities of both events.
11. Collect the data of age of more than 100 peoples of your community.
    a. Make continuous frequency distributions of class size 20, 15, 12, 10, 8 and 5.
    b. Construct histograms and the frequency polygons and frequency curves in each cases.
    c. Estimate the area between the frequency curve and frequency polygon in each cases.
    d. Find the trend and generalize the result.
    e. Present the result in class.
12. A metallic bar of length 96 inch was used to make a rectangular frame. Find the dimension of the rectangular metallic frame with maximum area.
13. Find the roots of any polynomial by using ICT and present in the classroom.
14. Search a daily life problem on projectile motion. Solve that problem and present in the classroom.
15. Construct mathematical models involving supply and income, budget and cost constraint of a production company.

Sample project works/mathematical activities for grade 12

1. Represent the binomial theorem of power 1, 2, and 3 separately by using concrete materials and generalize it with n dimension relating with Pascal's triangle.
2. Take four sets R, Q, Z, N and the binary operations +, –, ×. Test which binary operation forms group or not with R, Q, Z, N.
3. Prepare a model to explore the principal value of the function $\sin^{-1}x$ using a unit circle and present in the classroom.
4. Draw the graph of sin–1x, using the graph of sin x and demonstrate the concept of mirror reflection (about the line y = x).
5. Fix a point on the middle of the ceiling of your classroom. Find the distance between that point and four corners of the floor.
6. Construct an ellipse using a rectangle.
7. Express the area of triangle and parallelogram in terms of vector.
8. Verify geometrically that: $\vec{c} \times (\vec{a} + \vec{b}) = \vec{c} \times \vec{a} + \vec{c} \times \vec{b}$
9. Collect the grades obtained by 10 students of grade 11 in their final examination of English and Mathematics. Find the correlation coefficient between the grades of two subjects and analyze the result.
10. Find two regression equations by taking two set of data from your textbook. Find the point where the two regression equations intersect. Analyze the result and prepare a report.
11. Find, how many peoples will be there after 5 years in your districts by using the concept of differentiation.
12. Verify that the integration is the reverse process of differentiation with examples and curves.
13. Correlate the trapezoidal rule and Simpson rule of numerical integration with suitable example.
14. Identify different applications of Newton's law of motion and related cases in our daily life.
15. Construct and present Cobweb model and lagged Keynesian macroeconomic model .

6. Learning Facilitation Method and Process

Teacher has to emphasis on the active learning process and on the creative solution of the exercise included in the textbook rather than teacher centered method while teaching mathematics. Students need to be encouraged to use the skills and knowledge related to maths in their house, neighborhood, school and daily activities. Teacher has to analyze and diagnose the weakness of the students and create appropriate learning environment to solve mathematical problems in the process of teaching learning.

The emphasis should be given to use diverse methods and techniques for learning facilitation. However, the focus should be given to those method and techniques that promote students' active participation in the learning process. The following are some of the teaching methods that can be used to develop mathematical competencies of the students:

- Inductive and deductive method
- Problem solving method
- Case study
- Project work method
- Question answer and discussion method
- Discovery method/ use of ICT
- Co-operative learning

7. Student Assessment

Evaluation is an integral part of learning process. Both formative and summative evaluation system will be used to evaluate the learning of the students. Students should be evaluated to assess the learning achievements of the students. There are two basic purposes of evaluating students in Mathematics: first, to provide regular feedback to the students and bringing improvement in student learning-the formative purpose; and second, to identify student's learning levels for decision making.

a. Internal Examination/Assessment

i. **Project Work**: Each Student should do one project work from each of eight content areas and has to give a 15 minute presentation for each project work in classroom. These seven project works will be documented in a file and will be submitted at the time of external examination. Out of eight projects, any one should be presented at the time of external examination by each student.

ii. **Mathematical activity**: Mathematical activities mean various activities in which students willingly and purposefully work on Mathematics. Mathematical activities can include various activities like (i) Hands-on activities (ii) Experimental activities (iii) physical activities. Each student should do one activity from each of eight content area (altogether seven activities). These activities will be documented in a file and will be submitted at the time of external examination. Out of eight activities, any one should be presented at the time of external examination by each student.

iii. **Demonstration of Competency in classroom activity**: During teaching learning process in classroom, students demonstrate 10 competencies through activities. The evaluation of students' performance should be recorded by subject teacher on the following basis.

- Through mathematical activities and presentation of project works.
- Identifying basic and fundamental knowledge and skills.
- Fostering students' ability to think and express with good perspectives and logically on matters of everyday life.
- Finding pleasure in mathematical activities and appreciate the value of mathematical approaches.
- Fostering and attitude to willingly make use of mathematics in their lives as well as in their learning.

iv. **Marks from trimester examinations**: Marks from each trimester examination will be converted into full marks 3 and calculated total marks of two trimester in each grade.

The weightage for internal assessment are as follows:

Classroom participation	Project work /Mathematical activity (at least 10 work/activities from the above mentioned project work/mathematical activities should be evaluated)	Demonstration of competency in classroom activity	Marks from terminal exams	Total
3	10	6	6	25

b. External Examination/Evaluation

External evaluation of the students will be based on the written examination at the end of each grade. It carries 75 percent of the total weightage. The types and number questions will be as per the test specification chart developed by the Curriculum Development Centre.

Secondary Education Curriculum
2076
Business Mathematics

Grades: 11 and 12 **Subject code:** Bmt. 405 **(Grade 11),** Bmt. 406 **(Grade 12)**

Credit hrs: 5 **Working hrs: 160**

1. Introduction

Business primarily revolves around the financial transaction or products that have some monetary value. Involvement of finance makes it extremely important to have sufficient knowledge about the basics of calculations. This is where business mathematics comes into play. It deals with the fundamental topics that one needs to carry out business related calculations. Realizing the necessity to impart the same on students, the curriculum has been developed for Grades 11 and 12 so as to prepare them for job market and for higher studies.

The curriculum of Business Mathematics for Grade 11 and 12 is designed to equip the students with mathematical and statistical concepts applicable in business and economics. The purpose of this course, then, is to present mathematical and statistical skills and concepts so that the students will be able to use them in management, economics, and social sciences. As mathematics and statistics are widely used in economics, business and finance, the students need a certain level of skill and understanding of the basic mathematical and statistical methods. The pedagogical approaches in delivering the course should consider the balance between theory and practice. In doing so, students should provide ample opportunities of working actively in real-world problems. The same applies in case of student evaluation procedure too.

The curriculum has different sections: level-wise competencies, grade-wise learning outcomes, contents and their elaboration, suggested project works, learning facilitation process and the assessment procedure. The major content areas included in this course are: algebra, calculus, financial mathematics, linear programming, statistics and probability.

2. Level-wise Competencies

By the end of the grade 12, the students will have the following competencies.

1. Understand the concepts of algebra and employ a variety of thinking processes and strategies to truly understand the concepts that underlie the business problems.
2. Apply calculus in business and economics fields.
3. Apply partnership, present worth and discount, arithmetic sequence and series, geometric sequence and series, compound interest and depreciation, NPV and IRR, annuity in business and many other field.
4. Maximize the profit and minimize the cost under very limited resources used.
5. Apply statistical knowledge and skills for their personal development and future career pathways, and analyze the data using Ms. Excel.
6. Develop appropriate process skills for the acquisition and application of mathematical concepts and skills.

7. Apply mathematical and statistical knowledge and skills for their personal development and future career pathways.
8. Apply modern technology to solve problems related to business and economic fields.

3. Grade-wise Learning Outcomes

S. N.	Content Area	Grade 11	Grade 12
1	Algebra	1.1 Define functions, inverse and composite functions. 1.2 Draw the graphs of linear functions. 1.3 Find the slope and intercepts of a line. 1.4 Solve linear inequalities and use their properties. 1.5 Define absolute values and use their properties (without theoretical proof). 1.6 Apply the linear functions in economics and management. 1.7 Solve system of linear equations. 1.8 Solve economic problems involving systems of linear equations. 1.9 Solve quadratic equations, quadratic inequalities. 1.10 Sketch the graph of a quadratic function with its main characteristics. 1.11 Solve economic and management problems involving quadratic equations. 1.12 Define exponential and logarithmic functions. 1.13 Solve exponential and logarithmic equations. 1.14 Solve economic and management problems involving exponential and logarithmic functions. 1.15 Use excel for graphing linear	1.1 Perform matrix operations. 1.2 Use laws of matrix algebra. 1.3 Find the transpose of a matrix. 1.4 Evaluate determinants (up to third order). 1.5 Find adjoint and inverse of a matrix. 1.6 Solve system of linear equations by Cramer's rule, inverse matrix method and Gauss elimination method. 1.7 Solve problems of input/output analysis. 1.8 Use excel in solving problems of matrix algebra.

		and quadratic functions and for solving related equations.	
2	Calculus	2.1 Define the limit of a function. 2.2 Finding the limits of algebraic functions. 2.3 Define and test continuity of a functions. 2.4 Define the derivative of a function. 2.5 Find the derivatives by using rules of differentiations. 2.6 Differentiate implicit and parametric functions. 2.7 Find higher-order derivatives up to third order. 2.8 Use differentiation in marginal analysis. 2.9 Define integration as the reverse process of differentiation. 2.10 Integrate using rules/methods of integration (by decomposition of the integrand, by substitution and by parts). 2.11 Find the total cost, total revenue and total profit functions. (Note: Derivatives and anti-derivatives of algebraic, logarithmic and exponential functions only.)	2.1 Define monotonic functions and test the monotonicity. 2.2 Identify stationary point and point of inflection. 2.3 Solve problems related elasticity of demand. 2.4 Acquaint with relation between the marginal revenue, average revenue and elasticity of demand. 2.5 Optimize functions of one variable using derivatives. 2.6 Define the definite integral using the Fundamental Theorem of Calculus. 2.7 Find the area under a curve (simple problems only). 2.8 Solve problems of marginal analysis, consumer and producer surplus. 2.9 Solve first-order linear differential equations with constant coefficient and constant term. 2.10 Solve differential equations for limited and unlimited growth. 2.11 Dynamics of market price function(Dynamic analysis0)
3	Financial Mathematics	3.1 Solve problems of partnership, present worth and discount. 3.2 Define arithmetic sequences and series. 3.3 Solve the problem related to A.P 3.4 Solve economics and business problems involving arithmetic sequences and series.	3.1 Solve problems of geometric sequence and series. 3.2 Solve problems of compound interest and depreciation. 3.3 Find net present value and internal rate of return. 3.4 Compare investment projects. 3.5 Solve problems of ordinary annuity, annuity due, deferred

		3.5 Use excel in solving problems of financial mathematics.	annuity, perpetuities and sinking funds. 3.6 Use excel in solving problems of financial mathematics.
4	Linear Programming Problem	4.1 Find graphical solutions of a system of linear inequalities. 4.2 Solve LP problems by graphical method and apply them in economics. 4.3 Use excel in graphing linear inequalities and solving LPP by graphical method.	4.1 Define standard LP Problems. 4.2 Solve LP Problems by simplex method and its application in business and economics. 4.3 Solve standard minimization LP Problems using duality.
5	Statistics	5.1 Divide the dataset into classes. 5.2 Build cumulative frequency distribution. 5.3 Find arithmetic and weighted arithmetic means, correct mean, median, partition values (quartiles, deciles and percentiles) and mode. 5.4 Find the missing frequencies when total frequency and either mean, median or mode are given. 5.5 Do appropriate choice of an average. 5.6 Find range, quartile deviation, mean deviation, standard deviation and their relative measures. 5.7 Find variance, coefficient of variation and combined standard deviation. 5.8 Find the correct standard deviation. 5.9 Use excel in solving problems of central tendency and dispersions.	5.1 Find Karl Pearson's and Bowley's coefficient of skewness. 5.2 Find the five number summary of raw data. 5.3 Define correlation and find correlation coefficient by Karl Pearson's method and interpret the result. 5.4 Define regression and find regression lines of Y on X and X on Y using least square method. 5.5 Use excel in solving problems of Skewness, Correlation and Regression.

6	Probability	6.1 State the basic principles of counting and solve related problems. 6.2 Find permutations of set of objects all different and set of objects not all different (simple cases only) and solve the problems related to combinations (simple cases only). 6.3 State mathematical and empirical definition of probability. 6.4 Solve the simple problems of probability using combinations. 6.5 Acquaint with dependent and independent events. 6.6 State two basic laws of probability and use it to solve related simple problems. 6.7 Use excel in solving problems of permutation, combination and probability.	6.1 Define conditional probability and solve the related problems. 6.2 Use multiplication law of probability for dependent events. 6.3 State and apply the Bayes' theorem (simple problems only). 6.4 Define mathematical expectation and variance of a discrete random variable and solve related problems. 6.5 Define binomial distribution. 6.6 Use characteristics of the binomial distribution to solve the simple problems only. 6.7 Find mean and standard deviation of the binomial distribution. 6.8 Use excel in solving problems of conditional probability, Bayes' theorem, Expected Value, Binomial Probability.

4. Scope and Sequence of Contents

S. N.	Content Area	Grade 11		Grade 12	
		Elaboration of Contents	**Working hrs**	**Elaboration of Contents**	**Working hrs**
1	**Algebra**	**1.1 Linear Functions, Equation and Inequalities** o Functions o Inverse and composite functions o Linear Equations o Linear Functions and their graphs o Slope and intercepts of a line	21	**1.1 Matrices and Determinants** o Matrix and its Operations o Laws of Matrix Algebra o Transpose of a matrix o Determinants (up to third order) o Adjoint and	21

		o Inequalities and their properties (without theoretical proof) o Absolute values and their properties (without theoretical proof) **1.2 Applications** o Demand, supply, cost, revenue and Profit functions o Elasticity of demand, supply and income o Budget and cost constraints **1.3 System of linear equations** o Solving System of linear equations (Up to three variables) **1.4 Applications** o Supply and Demand Analysis o Break-Even Analysis o Consumer and producer surplus o National income determination **1.5 Quadratic Functions and Equations** o Quadratic Functions o Quadratic equations o Quadratic inequalities o Main characteristics (open upward and downward, domain and range, zeroes, vertex, axis of symmetry and intercepts)		Inverse of a matrix o Elementary row operations o Solving System of linear equations (Up to three variables by using Cramer's rule, inverse matrix method and Gauss elimination method o Input/output analysis **1.2 Comp. Work**: Excel for matrix algebra	

		o Sketching the graph of a quadratic function with its main characteristics **1.6 Applications** o Supply and Demand Analysis o Break-Even Analysis o Optimization **1.7 Exponential and Logarithmic functions** o Exponential functions o Logarithmic functions and their properties o Natural and common logarithms o Exponential and Logarithmic equations o Economics and Management Applications **1.8 Comp. Work**: Excel for linear and quadratic functions and equations			
2	**Calculus**	**2.1 Limit and Continuity** o Limit of a function o Procedure of finding Limit o Limit at infinity o Continuity of a function Note: Algebraic function only **2.2 Differentiation** o Derivatives o Average and Instantaneous Rates of	40	**2.1 Applications of Derivatives** o Monotonic functions o Stationary point and Point of inflection o Elasticity of demand and the derivatives o Relation between the marginal revenue, average revenue and elasticity of demand	40

		Change o Rules of differentiations o Implicit and parametric Differentiation o Higher-Order Derivatives upto third order Note: Algebraic, exponential and logarithmic function only **2.3 Applications** o Marginal cost, Marginal revenue and Marginal profit **2.4 Indefinite Integration** o Integration as the reverse process of differentiation o Rules of integrations o Total cost, total revenue and total profit function		o Optimization of functions of one variable o Economic application of maximum and minimum points (Algebraic function only) **2.2 Definite Integral and its Applications** o Definite Integral using the Fundamental Theorem of Calculus o Area Under a Curve (simple problems only) o Marginal analysis o Consumer and Producer Surplus **2.3 Differential equations and Applications** o Differential equations and necessary terminologies o Solution of first-order linear differential equations with constant coefficient and constant term o Differential equations for limited and unlimited growth o Dynamics of market price functions (Dynamic	

				analysis)	
3	**Financial Mathematics**	**3.1 Financial Mathematics** o Partnership o Present worth and Discount o Arithmetic Sequences and series and their applications **3.2 Comp. Work**: Excel for financial mathematics	17	**3.1 Financial Mathematics** o Geometric sequence and series o Compound Interest and Deprecation o Net present value and internal rate of return o Ordinary annuity o Annuity due o Deferred annuity o Perpetuities o Sinking funds **3.2 Comp. Work**: Excel for financial mathematics	17
4	**Linear Programming Problem**	**4.1 Linear Programming Problem** o Linear inequalities and their graphical solutions o Graphical method of solving LPP o Application of LPP in economics and business **4.2 Comp. Work**: Excel for graphical method of solving LPP	10	**4.1 Linear Programming Problem** o Standard LP Problems o Simplex method of solving linear programming problem (two decision variables only) o Duality and Standard Minimization LP Problems **4.2 Comp. Work**: Online Simplex Method	10

5	**Statistics**	**5.1 Measures of central Tendency** o Exclusive and inclusive classes, cumulative frequency distribution and open end classes o Mean (arithmetic and weighted arithmetic means) o Combined mean of two series o Median o Partition values o Mode o Choice of an average **5.2 Measures of Dispersion** o Range and its relative measure o Quartile deviation and its relative measure o Mean deviation from mean and median and their relative measures o Standard deviation and its relative measure o Coefficient of Variation o Variance o Combined standard deviation **5.3 Comp. Work**: Excel for central tendency and dispersion	**20**	**5.1 Skewness** o Karl Pearson's and Bowley's coefficient of skewness **5.2 Correlation** o Correlation Coefficient by Karl Pearson's method and its Interpretations **5.3 Regression** o Regression lines of Y on X and X on Y by least square method **5.4 Comp. Work**: Excel for Skewness, five number summary of raw data, Correlation and Regression	**20**

6	**Probability**	**6.1 Permutation and Combination** o Basic Principles of counting o Permutation: Set of objects all different, set of objects not all different (simple cases only) o Combination of things all different (simple cases only) **6.2 Probability** o Mathematical and empirical definition of probability o Dependent and Independent Events o Basic laws of probability (without theoretical proof) **6.3 Comp. Work**: Excel for Permutation, combination, probability and basic laws of probability.	12	**6.1 Probability** o Conditional probability o Multiplication Law of probability (dependent events only) o Bayes' theorem **6.2 Random Variables** o Mathematical expectation and Variance of Discrete Random Variable **6.3 Binomial Distribution** o Binomial distribution o Characteristics of the Binomial Distribution o Mean and Standard Deviation of the Binomial Distribution **6.4 Comp. Work**: Excel for Conditional probability, Bayes' theorem, Expected Value, Binomial Probability	12
Total			**120**		**120**

5. Suggested Practical/Project Activities

During project works, students learn by actively engaging in real-world. Project work allows the students to study, do research and act by themselves using their abilities, interests, personal experience and aptitudes. Doing the computer works using excel requires students solve and analyze mathematical and statistical problems.

Each Student should do one project work or computer work (in the given table below, the second row in each content areas contains the project works and content areas where there is only one row the task is designed for project work) from each of six content areas and should give a 15-minute presentation. The project works or computer works will be documented in a file and will be submitted at the time of practical evaluation. Out of the project works, anyone can be presented at the time of practical evaluation.

Whatever the style, the project work should include the following points:

- Historical background
- Description
- Key features or properties
- Relationship with others
- Geometrical illustrations
- Practical significance
- Varieties of examples other than those given in the textbook
- Limitations
- Varieties of problems with solutions other than those given in the textbook
- Use in everyday life, business, economics, finance, etc.
- Conclusion

The project works will be evaluated on the basis of clarity of aims, originality, presentation style and the skills demonstrated.

S. N.	Content Area	Tasks	Working Hours
		Grade 11	
1	**Algebra**	o Calculating numerical expressions and creating function tables. o Graph linear functions and equations and finding intersection points using excel. o Solving equations using the quadratic formula, SOLVER, and graphs. o Evaluating expressions involving exponential and logarithms using excel. o Sketching graph of exponential and logarithmic functions using excel.	7
		o Functions in the real world. o Linear functions and linear equations in the real world. o Linear functions and inequalities in events of daily lives.	

		o Quadratic functions in the real world. o Application of quadratic equation and inequality in real life situation. o Sketching and drawing graphs of linear and quadratic functions.	
2	**Calculus**	o Calculus in daily life. o Continuity of a function applied in everyday life. o Applications of derivatives in Business and Economics. o Applications of Calculus in day to day life. o Integration in the real world. o Application of integration in business and economics.	7
3	**Financial Mathematics**	o Solving problems on present worth and discount. o Solving problems on arithmetic sequence and series using excel	6
		o Partnership of sharing profit in the real world. o Applications of present worth and discount in daily life events. o Applications of arithmetic sequence and series in daily life events.	
4	**Linear Programming Problem**	o Solving LP problems using Solver.	5
		o Applications of Linear programming problem in Economics and Business.	
5	**Statistics**	o Calculating mean, median, partition values and mode for individual series, discrete series and continuous series using excel. o Calculating combined mean of two series using excel. o Calculating maximum value, minimum value, range, quartile deviation, mean deviation, standard deviation and variance for individual series, discrete series and continuous series using excel. o Calculating coefficient of range, coefficient of quartile deviation, coefficient of mean deviation and coefficient of variation for individual series, discrete series and continuous series using excel.	11

		o Investigation on how people use mean, median and mode in their daily life events. o Choice of averages o Measures of dispersion applied to events in real life situations.	
6	**Probability**	o Solving some problems on permutation and combination using excel. o Finding probability of an event and probability of an event involving combination using excel. o Finding the probability related to two basic laws of probability using excel	4
		o Investigation on how probability is used in real life.	
	Total		**40**
Grade 12			
1	**Algebra**	o Performing basic operations on matrices using excel. o Evaluating a determinant of a Matrix using excel. o Solving system of linear equations using matrices. o Solving problems involving a Leontief input–output model using excel.	7
		o Applications of matrices in real life. o Methods of solving system of linear equations by using Cramer's rule, inverse matrix method and Gauss elimination method.	
2	**Calculus**	o Applications of maxima and minima of one variable in daily life. o Calculating consumer surplus and producer surplus using definite integral. o Applications of differential equations with constant coefficient and constant term in economics.	7
3	**Financial Mathematics**	o Solving some problems of geometric sequence and series using excel. o Solving some problems of compound interest and depreciation using excel. o Solving some problems of net present value and internal rate of return using excel. o Solving some problems on amount of immediate annuity	6

		and annuity due using excel. o Solving some problems on present value of immediate annuity and annuity due using excel. o Solving some problems on present value of deferred annuity using excel. o Solving some problems on present value of perpetual annuity using excel.	
		o Investigation on geometric sequence and series can be applied in real life situations. o Applying the concept of compound interest and depreciation in all areas of life. o Net present value (NPV) and internal rate of return (IRR) methods for project evaluation. o Calculating amount and present values of annuities in real life situations.	
4	**Linear Programming**	o Simplex method of solving linear programming problem(LPP)	5
		o Simplex method of solving linear programming problem(LPP)	
5	**Statistics**	o Calculating Karl Pearson's and Bowley' coefficient of skewness for individual series, discrete series and continuous series using excel. o Calculating five number summary for individual series, discrete series and continuous series using excel. o Calculating Karl Pearson's correlation coefficient using excel. o Estimating regression lines of Y on X and that of X on Y using excel.	11
		o Skewness in statistics. o Calculating correlation coefficient by Karl Pearson's method and its interpretation in real life situations. o Estimating simple regression lines of Y on X and X on Y in real life situations.	
6	**Probability**	o Solving some problems on conditional probability and Bayes' theorem using excel. o Finding expected value and variance of discrete random variable using excel. o Finding the probability of an event of binomial distribution	4

		using excel. o Finding the mean and standard deviation of binomial distribution using excel.	
		o Developing conceptual understanding of Conditional Probability and Bayes' theorem through explanation. o Developing conceptual understanding of Binomial distribution through explanation.	
		Total	**40**

Pre-requisites for computer based tasks: Spreadsheets Introduction, Files, Cells, Cell Address, Cell Format, Cell Content, Cell Value, Formulas, Copy, Paste, Fill, Charts, Conclusion.

6. Learning Facilitation Methods and Process

The following principles should guide the learning facilitation of business mathematics:

- One of the most important principles in teaching mathematics is **"Let It Make Sense"**. The course assumes minimal mathematical background but includes the usefulness and relevance of basic mathematics in economics, finance, and business.
- **Students need to be able to navigate their lives in this ever-so-complex modern world.** This involves dealing with interest, annuities, taxes, loans, purchases, budgeting etc. Our youngsters need to be able to handle money wisely. All that requires good understanding of parts, proportions, and percentages.
- Another very important approach of mathematics education as a whole is to **enable the students to understand information around us**. In today's world, this includes quite a bit of scientific information. Being able to read through it and make sense of it requires knowing statistics and probability.
- We need to **prepare our students for further studies**. Not everyone ultimately needs algebra, calculus, linear programming, but many do, and teens don't always know what profession they might choose or end up with.
- **Let students see some beauty of mathematics** and **learn to like it**, or at the very least, make sure they don't have negative felling towards mathematics.
- Finally, **let students be familiar with modern computation skill.** This involves working with excel.

It's important to **learn how to use any tool** the student might acquire. Quantity won't equal quality. Knowing a few "math tools" inside out is more beneficial than a mindless dashing to find the newest activity to spice up the math lessons. In this course, we do not show how the mathematical results have been obtained and proved, but we show how they may be used in real-life economics and business.

Gaining purposeful learning experiences through solving problems in relevant and meaningful contexts allows students to view mathematics in a practical setting relevant to their intended careers, and also motivates them to move on to increasingly more abstract concepts.

Teacher has to analyze and diagnose the weakness of the students and create appropriate learning environment to solve mathematical problems in teaching learning process. The

following are some of the methods and techniques which can be used in delivering this course.

- Problem solving
- Case study
- Project work
- Question answer
- Discussion
- Discovery
- ICT
- Co-operative learning
- Lecture

7. Student Assessment

Continuous assessment of students for formative purpose will be an integral part of teaching learning process. Student's summative evaluation will be done using both internal (25%) and external examination (75%).

(a) Internal Evaluation

Practical evaluation includes written tests (first term, second term), classroom participation and project work including presentation /excels lab work. The scores of evaluation will be used for providing feedback and to improve their learning. The criteria for internal evaluation is shown in the following table:

S. N.	Criteria	Marks
1	Classroom participation (Daily attendance, home assignment and classwork, participation in learning, participation in other activities)	3
2	Trimester exam (3 marks from each trimester exam)	6
3	Project work, project report and presentation	16
	Total	**25**

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 75 percent of the total weightage. The types and number questions will be as per the test specification chart developed by the Curriculum Development Centre.

Secondary Education Curriculum

2076

Environmental Science

Grade: 11 and 12 **Subject Code:** Ens. 413 **(Grade 11),** Ens. 414 **(Grade 12)**

Credit Hour: 5 **Annual Working hours: 160**

1. Introduction

Environmental Science is an interdisciplinary subject that deals with the interrelationship and interdependence between living beings and their surrounding environment. In the present context of growing population, increased urbanization and unsustainable use of resources, the resource stock across the country as well as in globe is shrinking and degrading. In Nepal, where the national economy and people's livelihood are intricately linked to natural resources, the sustainable utilization and management of these resources has become a pressing challenge. In this connection, educating and raising environmental awareness is the key option for sustainable resource utilization. Environmental Science provides essential base for the study of complex inter-relationship between various natural and anthropogenic phenomena. Therefore, the relevancy of the subject has been greatly realized over the period of time.

This curriculum presumes that the students opting Environmental Science in Grade 11 and 12 come with diverse aspirations; some of them may continue higher level studies in Environmental Science, others may join technical and vocational areas or even other streams. The curriculum is designed to provide students with general understanding of the fundamental laws and principles governing environmental sustainability paradigms. It focuses to develop basic scientific understanding, skills, competences and attitudes required at secondary level (Grade 11-12). The curriculum expects developing environmental understanding based on scientific grounds and applications in daily life as well as obtaining new knowledge through integrated approach.

The curriculum has been structured for two years in such a way that it builds the knowledge, understanding and basic principles of environmental science with intrinsic linkages between life, livelihood and environment. It also tries to develop an understanding on local impacts of global phenomena and vice-versa. It incorporates the level-wise competencies, grade-wise leaning outcomes and scope and sequence of contents, suggested practical/project activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject.

2. Level-wise Competencies

On completion of this course, students are expected to demonstrate the following competencies:

1. Relate with various components of the earth
2. Recognize the services and values obtained from ecosystem
3. Demonstrate capability in dealing with environmental resources and their effective management
4. Use appropriate tools, techniques and methods in solving environmental problems and disseminate evidence based information to the community

5. Demonstrate ability to prevent and control environmental degradation and pollution
6. Acknowledge importance of ecosystem and biodiversity for environmental stability
7. Use the environmental knowledge and technology for national development and environment sustainability

3. Grade-wise Learning Outcomes

Grade 11

S. N.	Content Area	Learning Outcomes
1.	**Fundamental of Environmental Science**	1.1. Differentiate environment, ecology and environmental science. 1.2. Explain scope and importance of environmental science. 1.3. Explain environment as life supporting system (four spheres). 1.4. Describe earth as a closed system. 1.5. Show relationship between natural resources, population and environment.
2.	**Population Dynamics**	2.1. Explain environmental factors and population. 2.2. Describe nutrients as limiting factors. 2.3. Explain positive, negative and neutral interaction between the species. 2.4. Describe R and K selected growth. 2.5. Analyze population and community characteristics (Density, Frequency, Abundance, Natality, and Mortality).
3.	**Ecosystem Dynamics**	3.1. Delineate structural and functional aspects of ecosystem. 3.2. Describe evolution of ecosystems. 3.3. Classify various types of ecosystems. 3.4. Define food chain, food web and trophic level. 3.5. Explain nutrients (P, C, N, S) and energy flow in ecosystem.
4.	**Environmental Resources**	4.1. Classify various environmental resources. 4.2. Describe water resources with respect to its spatial and temporal variability, water crisis, conservation. 4.3. Identify and explain major forest types of Nepal, and discuss cause and consequences of forest degradation and fragmentation. 4.4. Explain mineral resources of Nepal in term of potential and uses, environmental implication of mining. 4.5. Discuss energy resources (demand-supply trend and projection, renewable and non-renewable energy, use of

		alternative energy sources). 4.6. Discuss ecocentric and anthropocentric perspective of resource management. 4.7. Identify various types of ecosystem services and evaluate them.
5.	**Biodiversity Conservation**	5.1. Define biodiversity. 5.2. Describe biodiversity hotspots. 5.3. Discuss threats to biodiversity and conservation approaches (in-situ/ex-situ) in Nepal- Protected Areas, Conservation Areas, Hunting Reserves, Zoos, Botanical Gardens. 5.4. Explain biodiversity conservation approaches (species, ecosystem, landscape, trans-boundary).
6.	**Environmental Degradation**	6.1. Define environmental degradation. 6.2. Analyze various causes of environmental degradation: population growth, industrialization, urbanization, unsustainable agriculture. 6.3. Describe consequences of environmental degradation: pollution, soil erosion and siltation, habitat loss, loss of biodiversity. 6.4. Explain various control measures of environmental degradation.
7.	**Environmental Pollution**	7.1. Define pollution. 7.2. Describe air, water, land, noise and radiation pollution. 7.3. Identify various causes and sources of pollution. 7.4. Evaluate the effects of environmental pollution on human health, agriculture, ecosystem, biodiversity, water resources. 7.5. Find out the various pollution prevention measures.
8.	**Environmental Hazards**	8.1. Define hazard, vulnerability, risk and disaster. 8.2. Classify different types of hazards (Natural and Anthropogenic). 8.3. Describe Disaster Risk Management (DRM) Cycle. 8.4. Explain Disaster Risk Reduction (DRR) approaches. 8.5. Analyze Disaster Risk Reduction/Management in Nepal.
9.	**Chemical Environment**	9.1. List out different chemicals in found in the environment. 9.2. Explain chemical and photochemical reactions in atmosphere and environmental impacts of chemical reactions. 9.3. Describe chemical reactions in natural and waste-water.

		9.4. Demonstrate acid-base and ion exchange reactions in soil. 9.5. Explain industrial chemicals in environment.
10.	**Quantitative Environmental Analysis**	10.1. Describe quantitative analysis. 10.2. Give the concept of calibration, accuracy and precision. 10.3. Prepare chemical solutions (molar, molal, normal). 10.4 Explain function of instruments used in environmental analysis (pH meter, EC meter, TDS meter, DO meter, weighing machine, desiccators, soil sampling auger, spectrophotometer, colorimeter, Atomic Absorption Spectrophotometer, Flame Photometer, Chromatograph). 10.5. Explain volumetric, gravimetric, potentiometric, conductometric, and electrometric methods. 10.6. Compare electrolytic and colorimetric analysis.

3.2 Grade 12

S.N.	Content Area	Learning Outcomes
1.	**Atmospheric Environment**	1.1. Define atmosphere. 1.2. Explain atmospheric composition. 1.3. Illustrate vertical zonation of atmosphere (Troposphere, Stratosphere, Mesosphere, Thermosphere). 1.4. Characterize various meteorological parameters (heat budget, temperature, temperature inversion, pressure, wind-velocity, direction, humidity and precipitation). 1.5. Define brown and grey air smog. 1.6. Describe transport and diffusion of pollutants.
2.	**Hydrospheric Environment**	2.1. Define hydrological cycle 2.2. Explain global distribution of water. 2.3. Discuss unique properties of water. 2.4. Describe water as ecological medium. 2.5. Define and characterize lentic and lotic environment and, lake stratification and zonation.
3.	**Lithospheric Environment**	3.1. Define lithosphere and soil. 3.2. Discuss characteristics and properties of soil (physical, chemical and biological). 3.3. Describe soil profile and pedogenic processes. 3.4. Describe soil-water interactions.

		3.5. Explain impacts of anthropogenic activities on soil and their remedial measures.
4.	**Biodiversity Assessment**	4.1. Define biodiversity assessment. 4.2. Select appropriate sampling sites. 4.3. Demonstrate vegetation sampling (Plot and Plot-less) methods. 4.4. Describe direct and indirect sampling methods (Animal). 4.5. Explain quantification techniques.
5	**Climate Science**	5.1. Differentiate weather and climate. 5.2. Describe insolation and heat Budget (albedo). 5.3. Define greenhouse effects, climate change and global warming. 5.4. Explain green house and global warming mechanism. 5.5. Describe climate change impacts on Himalayan glaciers, water resource, agriculture, forest and biodiversity, health, tourism) in Nepal. 5.6. Discuss climate change adaptation and mitigation measures.
6.	**Solid Waste Management**	6.1. Classify solid wastes. 6.2. Explain sources, characteristics of solid wastes. 6.3. Describe effects of solid waste on environment. 6.4. Comprehend solid waste management approaches (collection, segregation, storage and transportation). 6.5. Prepare the hierarchy of solid waste management. 6.6. Apply solid waste management techniques: Open dumping, sanitary land filling, composting (aerobic and anaerobic), vermi-composing, incineration and energy recovery, integrated waste management.
7.	**Environmental Toxicology**	7.1. Define toxic chemical. 7.2. Illustrate the major toxic chemicals in environment. 7.3. Describe acute and chronic toxicity, and factors affecting toxicity. 7.4. Explain toxicity response curve with suitable diagram. 7.5. Relate effects of toxic chemicals in environment (population, ecosystem) and global incidences. 7.6. Analyze the process of bio-accumulation, bio-magnification in ecosystems.

8.	**Pollution Control Approaches**	8.1. Define pollution control. 8.2. Identify sources of pollution and their reduction measures. 8.3. Discuss the technological approaches (zero emission, waste treatment, energy efficient technologies, renewable energy, sustainable agriculture, 3R principles, etc.) of pollution control. 8.4. Observe and prepare a report on primary and secondary methods of waste-water treatment. 8.5. Describe the legal approaches (policies, laws, rules and regulations) of pollution control and role of local government.
9.	**Environmental Tools and Techniques**	9.1. Recognize the various geospatial tools and techniques: GPS, Theodolite, Geographical Information System (GIS), Remote Sensing (RS). 9.2. Identify various source of geospatial data: Satellite images and topographic maps. 9.3. Locate geographical coordinate system (degree decimal, degree-minute-second) and geo-referencing. 9.4. Explain land measurements system (various units). 9.5. Describe the working principle and application of GIS and RS in environmental studies.
10.	**Environmental Policies**	10.1. Recognize the need of environmental laws (Policies, Acts, Rules, Regulations, standards) in Nepal. 10.2. Explain historical evolution of Environmental Laws (global and Nepalese perspective). 10.3. List out the major environmental laws in Nepal. 10.4. Analyze Environmental Assessment Provisions (IEE, EIA, SEA) and Implementation in Nepal. 10.5. Describe Environment Assessment Process: screening, scoping, preparation of terms of reference, baseline information collection, etc.

4. Scope and Sequence of Contents

Grade 11

S. N.	Content Area	Elaboration of Contents	Working hours
1	**Fundamentals of Environmental Science**	1.1. Concept of environment, ecology and environmental science 1.2. Scope and importance of environmental science	**8**

		1.3. Environment as life supporting system (four spheres) 1.4. Earth as a closed system 1.5. Relationship between natural resources, population and environment	
2	**Population Dynamics**	2.1. Concept of environmental factors and population 2.2. Nutrients as limiting factors 2.3. Species interactions: positive, negative and neutral 2.4. R and K selected growth 2.5. Population and community characteristics (Density, Frequency, Abundance, Natality, Mortality)	12
3	**Ecosystem Dynamics**	3.1. Concept and components (Structural and Functional) of Ecosystem 3.2. Evolution of ecosystem 3.3. Types of ecosystem 3.4. Food chain, food web and trophic level 3.5. Nutrients (P, C, N, S) cycle and role of micro-organism and energy flow in ecosystem	**12**
4	**Environmental Resources**	4.1. Concept of environmental resources and their classification 4.2. Water resources (spatial and temporal variability, water crisis, conservation) 4.3. Forest: major forest types of Nepal, fragmentation and degradation, cause and consequences of forest degradation 4.4. Mineral Resources (potential and uses, environmental implication of mining) 4.5. Energy Resources (demand-supply trend and projection, renewable and non-renewable energy sources) 4.6. Perspectives of resource management (eco-centric and anthropocentric) 4.7. Ecosystem services: concept, types and valuation	12
5	**Biodiversity Conservation**	5.1. Concept of biodiversity 5.2. Biodiversity hotspots 5.3. Threats to biodiversity	**12**

		5.4. Biodiversity conservation (in-situ/ex-situ) in Nepal- National Parks, Wildlife Reserves, Conservation Areas, Hunting Reserves, Zoos, Botanical Gardens 5.5. Biodiversity conservation approaches (species, ecosystem, landscape, trans-boundary)	
6	**Environmental Degradation**	6.1. Concept of environmental degradation, 6.2. Causes of environmental degradation: population growth, industrialization, urbanization, unsustainable agriculture, 6.3. Consequences of environmental degradation: pollution, soil erosion and siltation, habitat loss, loss of biodiversity 6.4 Control measures of environmental degradation	12
7	**Environmental Pollution**	7.1. Concept of pollution 7.2. Pollution types: air, water, land, noise, radiation 7.3. Causes and sources of pollution 7.4. Effects of environmental pollution: human health, agriculture, ecosystem, biodiversity, water resources 7.5. Pollution prevention measures	**13**
8	**Environmental Hazards**	8.1. Concept of hazard, vulnerability, risk, disaster 8.2. Types of hazard (Natural and Anthropogenic) 8.3. Disaster Risk Management (DRM) Cycle 8.4. Disaster Risk Reduction (DRR) approaches 8.5. Disaster Risk Reduction/Management in Nepal	**12**
9	**Chemical Environment**	9.1. Concept of chemical environment 9.2. Chemical and photochemical reactions in atmosphere and environmental impacts of chemical reactions 9.3. Chemical reactions in natural and waste water 9.4. Acid-base and ion exchange reactions in soil 9.5. Industrial chemicals in environment	**12**
10	**Quantitative Environmental Analysis**	10.1. Concept of quantitative analysis 10.2. Calibration, accuracy and precision 10.3. Chemical solutions: molarity, molality, normality, buffer solution, standard solutions	15

		10.4. Instruments in environmental analysis (pH meter, EC meter, TDS, DO, weighing machine, desiccators, soil sampling auger, spectrophotometer, colorimeter, AAS, Flame Photometer, Chromatograph) 10.5. Volumetric, gravimetric, potentiometric, conduct metric, and electrometric methods 10.6. Electrolytic and Colorimetric analysis	

Grade 12

S. N.	Content Area	Elaboration of Contents	Working Hours
1	**Atmospheric Environment**	1.1. Concept of atmospheric environment 1.2. Atmospheric composition 1.3. Vertical zonation of atmosphere 1.4. Meteorological parameters (Heat budget, temperature, temperature inversion, pressure, wind-velocity, direction, humidity and precipitation) 1.5. Brown and grey air smog 1.6. Transport and diffusion of pollutants	**12**
2	**Hydrospheric Environment**	2.1. Concept of hydrological cycle 2.2. Global distribution of water 2.3. Unique properties of water 2.4. Water as ecological medium 2.5. Lentic and lotic environment and their characteristics, lake stratification and zonation	10
3	**Lithospheric Environment**	3.1. Concept of lithosphere and soil 3.2. Properties of soil: physical, chemical and biological 3.3. Soil profile and pedogenic processes 3.4. Soil-water interactions 3.5. Anthropogenic activities on soil: impact and remedial measures	**10**
4	**Biodiversity**	4.1. Concept of biodiversity assessment	**10**

	Assessment	4.2. Selection of sampling sites 4.3. Vegetation sampling (Plot and Plot-less) methods 4.4. Direct and indirect sampling methods (Animal) 4.5. Quantification techniques	
5	**Climate Science**	5.1. Concept of weather and climate 5.2. Insolation and heat budget (Albedo) 5.3. Green house effects, climate change and global warming 5.4. Green house and global warming mechanism 5.5. Climate change impacts (Himalayan glaciers, water resource, agriculture, forest and biodiversity, health, tourism) in Nepal 5.6. Climate change adaptation and mitigation	**12**
6	**Solid Waste Management**	6.1. Concept and types of solid wastes 6.2. Sources and characteristics of solid wastes 6.3. Effects of solid waste on environment 6.4. Solid waste management approaches (collection, segregation, storage and transportation) 6.5. Hierarchy of solid wastes management 6.5. Solid waste management techniques: open dumping, sanitary land filling, composting (aerobic and anaerobic), vermi-composing, incineration and energy recovery, integrated waste management	**14**
7	**Environmental Toxicology**	7.1. Concept of toxic chemicals in environment 7.2. Major toxic chemicals in environment 7.3. Acute and chronic toxicity, and factors affecting toxicity 7.4. Toxicity response curve 7.5. Effects of toxic chemicals on environment (population, ecosystem) and global incidences 7.6. Bio-accumulation, bio-magnification in ecosystems	**12**
8	**Pollution Control Approaches**	8.1. Concept of pollution control approaches 8.2. Source inventory and reduction 8.3. Technological approaches (zero emission, waste	**15**

		treatment, energy efficient technologies, renewable energy, sustainable agriculture, 3R Principles, etc.) of pollution control 8.4. Waste water treatment (primary and secondary) 8.5. Legal approaches (policies, laws, rules and regulations), role of local government	
9	**Environmental Tools and Techniques**	9.1. Concept of geospatial tools and techniques [GPS, Theodolite, Geographical Information System (GIS), Remote Sensing (RS)] 9.2. Source of data: satellite images and topographic maps 9.3. Geographical coordinate system (degree decimal, degree-minute-second) and geo-referencing 9.4. Land measurements system (various units) 9.5. Working principle and application of GIS and RS in environmental studies	**12**
10	**Environmental Policies**	10.1. Concept of environmental laws (Policies, Acts, Rules, Regulations, Standards) 10.2. Historical evolution of environmental laws (global and Nepali perspective) 10.3. Major environmental laws in Nepal 10.4. Environmental Assessment Provisions (IEE, EIA, SEA) and Implementation in Nepal 10.5. Environment Assessment Process: screening, scoping, preparation of terms of reference, baseline information collection, etc. 10.6. Sustainable development, Sustainable Development Goals and approaches	**13**
Total			**120**

5. Suggested Practical/Project Activities

This curriculum provides students with the opportunity to explore a range of topics of Environmental Science, and foster the skills to analyze the real field situations, including contemporary environmental challenges; the impact of the pollution on ecosystem health; waste management, etc. Students will also increase their scientific understanding and examine the interrelationships between science, environment and society. Project works outlined in the curriculum consist of activities designed to demonstrate the understanding and ideas through collecting, processing, analyzing and communicating the information. 40 working hours has been designated to practical and project activities in each grade. The practical/project works will enable the students to do the following.

- Identify and apply tools used in environmental sampling and analyze environmental data.
- Investigate a range of perspectives that have contributed to scientific knowledge about the environment, and apply these knowledge and procedures addressing environmental problems/issues.
- Recognize the major contemporary environmental challenges, acquire knowledge and demonstrate capability to report such situations.

The table below shows the suggested practical activities and projects works for both grades.

Practical Activities for Grade 11 (Any Eight)
1. Analyze the population trend of local/state/federal levels of Nepal. Assess how the population is increasing over time. Make the population pyramid of recent population census of Nepal.
2. Considering forest are nearby your settlement or school area, prepare a checklist of the plant species with their uses; enumerate the local names and scientific names for the species identified.
3. Illustrate with some primary data, pyramid of biomass and number of nearby grassland ecosystem.
4. Depict the energy consumption scenario in different sectors of Nepal.
5. Illustrate and draw diagram of the equipment used in volumetric analysis. Write the function of each equipment.
6. Prepare stock solution of the given concentration and series of standard solutions of different concentration from the stock solution. Illustrate how the color of the standard solutions changes with change in concentrations.
7. Measure and analyze pH, temperature, total suspended and dissolved solids contents in water samples collected from aquatic ecosystem.
8. Determine and compare transparency of any two aquatic ecosystems (nearby lakes) using Secchi disk.
9. Determine pH and bulk density of soils found in agriculture land, grassland and/or forestlands.
10. Determine temperature of soils found in agriculture land, grassland and/or forestlands.
11. Determine moisture content and water holding capacity of soils found in agriculture land, grassland and/or forestlands.
12. Determine the sound level in and around your surrounding area (using sound level meter).
Practical Activities for Grade 12 (Any Twelve)
1. Prepare list of various techniques for studying (plant and animal) populations and communities. Describe about each of them.
2. Determine and compare frequency, density and abundance of tree species of forest ecosystems having two different scenarios (for example, northern and southern facing slopes, disturbed and undisturbed forest sites, etc.).
3. Determine the distribution pattern of plant species (use either primary or secondary data).

Analyze the data using mean variance ratio test.

4. Make a wind-rose diagram from provided wind velocity data of a given meteorological station.
5. Determine relative and absolute humidity of an area (either from secondary data or primary data).
6. Analyze temperature and precipitation trend of one of a meteorological station of Nepal.
7. Determine the emission of greenhouse gases from energy use from various sources (using suitable IPCC protocol).
8. Assess the chlorophyll-a content in the selected aquatic ecosystem. Link it with the trophic status.
9. Collect the data of ambient air quality monitoring and analyze the collected data (authentic websites should be used for the retrieving air quality data).
10. Make the horizontal temperature profile of a selected area (choose nearby forest land, agricultural land, urban area and rural settlement sites, and compare the observed temperature in the area).
11. With the help of a topographic map, sketch different features of the selected catchment area.
12. Collect solid waste from household of nearby settlement and perform the analysis of solid waste composition and characterization.
13. Illustrate the methods of collection, processing and storage of effluent samples for physico-chemical analysis.
14. Determine the change in physical (temperature, total solids) and chemical (Dissolved Oxygen, pH, hardness, alkalinity, chloride) parameters of streams/river along the stretches.
15. Make a flowchart of EA process for development project in Nepal. Assess the EA report available (online or in hard copy), and list the different chapters and their organization.

Project Works for Grade 11 (Any Five)

1. Prepare a short report on types of ecosystem services provided by the lentic or lotic ecosystem. Provide quantitative information about provisioning services.
2. Prepare a report on local initiatives to reduce the impacts of pollution on human health (e.g., community cleanup and local level movements) [Suggestion: Before starting a project, prepare a checklist of activities to facilitate data collection].
3. Visit nearby waste-water treatment plant. Prepare a short report explaining and distinguishing the primary and secondary treatment processes of the plant; or if waste-water treatment plant is not available nearby your settlement, make an extensive review and prepare a short description report about the wastewater treatment processes).
4. Prepare list of disaster events (landslides, flooding, glacial lake outburst flood, flash floods, drought, epidemics, etc.) relevant to your area or nearby (Hint: taking help from senior citizens).
5. Identify the major potential disasters that can occur in your school, community/ward or municipality. Learn about disaster preparedness and safety using the internet and interviewing local experts. Use the information to create an emergency preparedness plan

that can be shared with the school, community and local authorities.

6. Prepare list of the natural resources available in your locality or municipality. Learn how other municipality, cities and counties getting economic benefit sustainably managing the resources. Prepare you own resource map and management plan which can be shared with local community member or local government officials.

Project Works for Grade 12 (Any Five)

1. Visit and observe a nearby ecosystem, prepare a report listing the abiotic and biotic factors. Illustrate how these factors are linked with each other.
2. Make a report about impacts of anthropogenic activities on soil environment (consider the site polluted due to of chemical fertilizer/pesticide or pollution or excavated or mine site).
3. Resource conservation project activities.
4. Visit nearby landfill site and prepare a report describing the features, storage capacity, ongoing activities, opportunities and challenges of the landfill site. (Suggestion: prepare a checklist of information to be collected before starting the project).
5. Visit nearby zoo (or any ex-situ conservation areas), list the ongoing practices, and prepare a report including opportunities/challenges of the ex-situ conservation practice.
6. Visit any industry nearby locality list the energy used, raw materials used, processing, product, pollutants emitted from the industry, noise and list the pollution control technologies (and their working principles) installed by the industries.
7. Visit and observe your village (Ward) and make the list of environmental problems (please try to collect as much as possible available secondary data) and prepare a report about the best ways to solve those environmental problems.
8. Considering a nearby urban area (close to your residence), prepare a report showing impacts of urbanization in altering hydrological process (Suggestion: prepare a checklist of information to be collected before starting the project).

6. Learning Facilitation Process and Methods

Students will be facilitated to learn rather than just accumulation of information. Teacher plays vital role for delivering subject matters. Student centered teaching-learning process is highly emphasized. Students are encouraged to adopt multiple pathways of learning, such as online search, field visit, library visit and literature review, laboratory work, individual and group work, research work, etc. with the support of teacher. Self-study by students is highly encouraged and learning will not be confined merely within the scope of curriculum. Teacher should keep in mind intra and inter-disciplinary approach to teaching and learning, as opposed to compartmentalization of knowledge. Supportive role of parents/guardians in creating conducive environment for promoting the spirit of inquiry and creativity in students' learning is anticipated.

During the delivery process of environmental science teaching in grade 11 and 12, basically the following three approaches will be adopted.

1. Conceptual/Theoretical Approach

The conceptual approach may include the following methods and techniques.

a. lecture b. discussion and interaction c. question answer d. demonstration e. ICT/online based instructions f. cooperative learning g. debate h. group discussions (satellite learning group, peer

group, small and large group) i. seminar presentation j. daily assignment k. project based learning l. innovation/discovery m. field survey

n. participating national and international environmental events

2. Practical/Application/Experimental Approach

Practical work is the integral part of the learning environmental science. The process of lab based practical work comprises

a. familiarity with objective of practical work

b. familiarity with materials, chemicals, apparatus

c. familiarity with lab process (safety, working modality, etc.)

d. conduction of practical work (systematically following the given instruction)

e. analysis, interpretation and drawing conclusion

3. Project Work Approach

Project work is an integral part of the learning in environmental science. Students should be involved in project work to foster self-learning of students in both theoretical and practical contents. Students will complete project work to have practical idea through learning by doing approach and able to connect the theory into the real world context. It is regarded as method/process of learning rather than content itself. So use of project work method to facilitate any appropriate contents of this curriculum is highly encouraged.

In this approach, student will conduct at least one research work, or an innovative work under the guidance of teacher, using their knowledge and skills. It could include any of the followings:

a. Mini research

b. Survey

c. Model construction

d. Paper based work

e. Study of ethno-science

General process of research work includes the following steps.

a. Understanding the objective of the research

b. Planning and designing

c. Collecting information

d. Analysis and interpretation

e. Reporting /communicating (presentation, via visual aids, written report, graphical etc.)

General process of innovative work includes the following steps;

a. Identification of innovative task (either assigned by teacher or proposed by student)

b. Planning

c. Performing the task

d. Presentation of the work

e. Record keeping of the work

Students are free to choose any topic listed in this curriculum or a topic suggested by teacher provided that it is within the theoretical contents of the curriculum. However, repetition of topic should be discouraged.

7. Student Assessment

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students. Class tests, unit tests, trimester test, oral question-answer, home assignment, etc., are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces both internal and external evaluation.

a) Internal Evaluation

Student's knowledge, skills and competencies will be measured through internal evaluation in both the Grades 11 and 12. The internal evaluation carries 25 percent of weightage for final evaluation of student achievement. The following table shows the criteria for the internal evaluation:

S. N.	Criteria	Marks
1	Classroom participation (Daily attendance, home assignment and classwork, participation in learning, participation in other activities)	3
2	Trimester exam (3 marks from each trimester exam)	6
3	Practical work	10
4	Project work, project report and presentation	6
	Total	**25**

The criteria for evaluating practical work and project works are in the table below.

S.N.	Criteria for Evaluation of Practical Work	Elaboration of criteria	Marks
1.	Laboratory experiment	Correctness of apparatus setup/preparation	1
		Observation/experimentation	1
		Tabulation	1
		Data processing and analysis	1
		Conclusion (Value of constants or prediction with justification)	1
2.	Viva-voce	Understanding of objective of the experiment	1
		Skills of the handling of apparatus in use	1

3	Practical work records	Records (number and quality)	3
	Total		**10**

Project Works Evaluation

S.N.	**Criteria for Project Works Evaluation**	**Marks**
1.	Reports (background, objective, materials and methods, finding, conclusion)	4
2.	Presentation	2
	Total	**6**

b) External Evaluation

External evaluation will take the form of written examination which carries 75 marks. The types and number questions will be as per the test specification chart developed by the Curriculum Development Centre.

Secondary Education Curriculum
2076
Basic Business Finance

Grade: 11 and 12 **Subject Code:** Fin. 417 **(Grade 11),** Fin. 418 **(Grade 12)**

Credit Hour: 5 **Annual Working hours: 160**

1. Introduction

Business finance is an important area of study which incorporates the fundamental aspects of economy. Finance at its origin, concerned with financial instruments and institutions only, has now been expanded to the areas like mathematics, statistics, working capital management, investment decision, financial analysis, risk, insurance, and international finance. Moreover, increased globalization and technology are dramatically transforming financial services and markets. Nowadays, there are growing concerns on financial issues such as growth and development of economy, rise and fall of stock markets, dividends, project budgets, imports, exports, ethical issues and so on.

This curriculum aims at presenting the basic financial literacy and fundamental principles of finance that facilitates in financial decisions in a simpler and lucid manner. This course contains basic contents of business finance and brings together some theoretical and practical perspectives. Hence, it is important to those who wish to enter the job market or continue their studies at university level.

Basic finance has been offered as one of the optional subjects in both Grades 11 and 12 according to the national curriculum framework. Along with level-wise competencies, grade-wise leaning outcomes and scope and sequence of contents, suggested practical/project activities, learning facilitation process and assessment strategies have been incorporated in the curriculum.

2. Level-wise Competencies

On completion of Grade 11 and 12, the students will build up the following competencies.

1. Describe meaning and functions of business finance
2. Explain different financial instruments used to mobilize financial resources
3. Identify and describe the role of financial institutions and financial markets
4. Develop basic understanding and skills on investing in primary market, trading in secondary market and using banking transactions
5. Explain the functions of micro finance and cooperatives and their transactions process
6. Describe the principles, types and procedures of insurance
7. Explain the functions of mutual fund
8. Calculate the interest rate, present value, future value of cash flows and the value of bond and common stock
9. Analyze financial statements
10. Identify the sources of fund with their features, advantages and disadvantages

11. Compute payback period and net present value
12. Describe working capital and its importance
13. Demonstrate the understanding of exchange rate quotation and compute the cross rate.

3. Grade-wise Learning Outcomes

3.1 Learning outcomes (Grade 11)

S. N.	Content Domain/area	Learning Outcomes
1	Introduction to Business Finance	1.1 Describe the meaning of business finance. 1.2 Explain the finance functions. 1.3 Describe the goal of a firm. 1.4 Identify finance functions in organization structure.
2	Business Entity and Financial Environment	2.1 List out key features of sole proprietorship, partnership, company. 2.2 Differentiate company from sole proprietorship and partnership. 2.3 Describe the financial environment. 2.4 Explain various types of financial institutions. 2.5 Describe the role of financial institutions.
3	Financial Assets	3.1 Explain various types of financial assets. 3.2 Distinguish between financial assets and real assets. 3.3 Differentiate ownership versus creditorship; fixed versus variable; and long-term versus short-term financial assets. 3.4 Describe different types of short-term and long-term instruments.
4	Financial Markets	4.1 Explain the concept, types and roles of financial markets. 4.2 Identify the differences between primary market and secondary market. 4.3 Identify the differences between money market and capital market. 4.4 Explain the meaning of organized securities, exchanges and over-the-counter market. 4.5 Write the meaning of IPO, FPO and rights offering. 4.6 Describe the process of buying and selling securities in secondary markets. 4.7 Explain the stock market quotations.

		4.8 Describe the functions of NEPSE and SEBON.
5	Commercial Banks	5.1 Explain the meaning, types and functions of banks. 5.2 Describe types of accounts/ deposits. 5.3 Classify the bank loans/ credits in various categories. 5.4 Explain the innovations in banking technology. 5.5 Explain the meaning and functions of Nepal Rastra Bank. 5.6 Describe the various classes of financial institutions by NRB.
6	Micro Finance and Cooperatives	6.1 Explain the concept, importance and functions of micro finance. 6.2 Differentiate between banks and micro finance. 6.3 Explain the meaning and types of cooperatives. 6.4 Differentiate between micro finance and saving credit cooperatives.
7	Risk and Insurance	7.1 Describe the meaning of risk and classify its types. 7.2 Explain the meaning and objectives of risk management. 7.3 Explain the meaning and identify basic characteristics of insurance. 7.4 Describe the evolution, functions and types of insurance. 7.5 Appreciate the benefits of insurance. 7.6 Identify the nature of insurable risk. 7.7 Understand fundamental legal principles of insurance. 7.8 Explain the features of insurance contract. 7.9 Understand the meaning and objectives of reinsurance. 7.10 Describe the methods of reinsurance. 7.11 Describe the role of Nepal insurance board.
8	Life and non-life Insurance	8.1 Explain the concept and importance of life insurance and non-life insurance. 8.2 Explain the types of life insurance and non-life insurance. 8.3 Identify and explain the basic elements of life insurance contract.

		8.4 Explain the procedures of affecting life insurance policy. 8.5 Calculate life insurance premium. 8.6 Describe the concept of micro insurance.
9	Mutual Fund, Pension Fund and other Financial Service Companies	9.1 Describe the concept, advantages and drawbacks of mutual fund. 9.2 Calculate net asset value (NAV) of mutual fund. 9.3 Distinguish between open- and closed-end funds. 9.4 Explain the growth of different types of mutual funds in Nepal. 9.5 Describe the role of pension fund companies and their prospect. 9.6 Describe the meaning and functions of merchant bankers. 9.7 Describe the meaning and importance of credit rating agency, Deposit and Credit Guarantee Corporation, Credit Information Bureau.
10	Time value of money	10.1 Explain the concept of time value of money. 10.2 Use the cash flow time line to represent cash flows occurred in different time period. 10.3 Explain the types of cash flows. 10.4 Calculate the present and future value of a present sum of money. 10.5 Explain the meaning of annuity cash flows. 10.6 Calculate the future value and present value of annuity cash flows. 10.7 Calculate the present value of perpetuity. 10.8 Calculate the present value and future value of uneven cash flows stream. 10.9 Compare nominal and effective rate. 10.10 Prepare amortization schedule for amortized term loan.

3.2 Learning Outcomes (Grade 12)

S. N.	Content Domain/Area	Learning Outcomes
1	Introduction to Business Finance	1.1 Describe the concept and meaning of business finance. 1.2 Explain the relationship of finance with economics and accountancy.

		1.3 Describe the responsibilities of a financial manager. 1.4 Explain the ethical issues in financial decision.
2	Financial Statements and Reporting	2.1 Describe the basic concepts of financial statements. 2.2 Identify and apply the contents of balance sheet. 2.3 Describe the contents of income and cash flow statement. 2.4 Identify the contents of statement of changes in equity structure. 2.5 Explain note to accounts. 2.6 Describe the common size statements. 2.7 Describe annual report.
3	Financial Analysis	3.1 Describe the importance of ratio analysis. 3.2 Compute and interpret the Liquidity ratios. 3.3 Compute and interpret the Asset Management ratios and the Debt Management ratios. 3.4 Compute and interpret the profitability ratios and the market value ratios. 3.5 Describe the DuPont equation.
4	Source of Fund	4.1 Decribe the concept and features of common stock, preferred stock and debt. 4.2 Explain the advantages and disadvantages of common stock, preferred stock and debt.
5	Capital Structure	5.1 Describe capital structure and financial structure. 5.2 Acquire the knowledge of optimal capital structure. 5.3 Describe the factors affecting capital structure decisions. 5.4 Identify the business risk and financial risk. 5.5 Explain Break-even Analysis and compute operating BEP.
6	Bond and Stock Valuation	6.1 Calculate the value of bond including semiannual compounding. 6.2 Calculate book value of common stock. 6.3 Calculate the value of common stock for finite holding periods. 6.4 Determine the value of common stock under zero and constant dividend growth model.

7	Capital Investment Decision	7.1 Describe the meaning and importance of investment decision. 7.2 Acquire the knowledge of various types of investment proposals. 7.3 Describe the steps of investment proposal evaluation techniques. 7.4 Compute the PBP and NPV.
8	Working Capital and Current Assets Management	8.1 Describe the concept, types and importance of working capital. 8.2 Explain the determinants of working capital. 8.3 Describe the concept of cash conversion cycle and compute CCC. 8.4 Understand various types of current assets. 8.5 Explain the concept and importance of cash and marketable securities management. 8.6 Explain the concept and importance of receivable management and inventory management.
9	Dividends and Dividend Payment Procedure	9.1 Describe the meaning, concept and forms of dividend. 9.2 Identify and explain the different types of dividend payout schemes. 9.3 Describe the dividend payment procedure. 9.4 Explain the factors influencing dividend decision.
10	International Finance	10.1 Describe the MNEs. 10.2 Differentiate between multinational and domestic financial management. 10.3 Acquire the knowledge of exchange rate. 10.4 Compute cross rate.

4. Scope and Sequence of Contents

Grade 11

S. N.	Content Area	Elaboration of Contents	Working Hour
1	Introduction to Business Finance	1.1 Meaning of business finance 1.2 Finance functions 1.3 Goals of the firm 1.4 Organization of finance functions	10

2	Business Entity and Financial Environment	2.1 Forms of business organization: 2.1.1 Sole proprietorship 2.1.2 Partnership 2.1.3 Company 2.2 Business and taxes 2.3 Financial environment 2.4 Financial assets 2.5 Financial market 2.6 Financial intermediaries: Introduction, types and role of financial institution 2.7 Other institutions	10
3	Financial Assets	3.1 Meaning and characteristics of financial assets 3.2 Real vs. financial assets 3.3 Instruments of financial assets 3.4 Long–term vs. short-term 3.5 Ownership vs. creditorship 3.6 Fixed return vs. variable return instruments 3.7 Derivatives 3.8 Long-term instruments: Common stock, preferred stock and bonds/Debentures 3.9 Short-term instruments: Treasury bill, bankers' acceptance, commercial paper, promissory notes, bill of exchange, letter of credit, certificate of deposits	10
4	Financial Markets	4.1 Concept and types of financial markets 4.2 Primary and secondary markets 4.3 Money and capital markets 4.4 The secondary market: organized exchanges and over-the-counter market 4.5 Role of financial markets 4.6 Participation in primary markets: Initial public offering (IPO), further public offering (FPO), rights offering 4.7 Demat account, CRN (Central-ASBA registration number) number 4.8 Participation in secondary markets: Stock broker, dealer, market maker, know your client	14

		(KYC) form, buy and sell order, stock quotations 4.9 Nepal Stock Exchange: Introduction and functions 4.10 Securities Board of Nepal: Introduction and functions	
5	Commercial Banks	5.1 Meaning and types of banks 5.2 Functions of bank 5.3 Services offered by commercial banks 5.4 Types of accounts (deposits) 5.5 Categories of loans (credit) 5.6 Innovations in Banking technology: 5.6.1 Online banking 5.6.2 Mobile banking 5.6.3 Internet banking 5.6.4 Swifts 5.7 Regulator of banks: Nepal Rastra Bank (NRB) 5.8 Functions of NRB 5.9 NRB classification of financial institutions: 5.9.1 Commercial bank 5.9.2 Development bank 5.9.3 Finance company 5.9.4 Micro finance	14
6	Micro Finance and Cooperatives	6.1 Concept and importance of micro finance 6.2 Functions of micro finance 6.3 Difference between banks and microfinance 6.4 Meaning and types of cooperatives 6.5 Organization of cooperatives 6.6 Difference between micro finance and saving and credit cooperatives	10
7	Risk and Insurance	7.1 Risk: Concept and types 7.2 Concept and evolution of insurance 7.3 Benefits of insurance 7.4 Nature of insurable risks 7.5 Principles of insurance	12

		7.6 Types of insurance 7.7 Features of insurance contract 7.8 Meaning, objectives and methods of reinsurance 7.9 Regulator of insurance companies: Nepal Insurance Board	
8	Life and non-life Insurance	8.1 Concept and importance of life insurance 8.2 Elements of life insurance contract 8.3 Procedures of affecting life insurance policy 8.4 Role of agents 8.5 Computation of life insurance premium 8.6 Types of life insurance 8.7 Concept and importance of non-life insurance 8.8 Types of non-life insurance and procedures 8.9 Concept and importance of micro insurance	10
9	Mutual Fund, Pension Fund and other Financial Service Companies	9.1 Mutual funds: Concept and advantages 9.2 Net asset value (NAV) of mutual funds 9.3 Open-end and close-end mutual fund 9.4 Difference between open-end and closed-end mutual fund 9.5 Growth of mutual funds in Nepal 9.6 Concept of pension fund companies 9.7 Role of pension fund companies 9.8 Meaning and role of merchant bankers 9.9 Functions of merchant bankers 9.10 Credit rating agency, Deposit and Credit Guarantee Fund, Credit Information Bureau	10
10	Time value of money	10.1 Concept of time value of money 10.2 Meaning of compounding and discounting 10.3 Concept of cash flow 10.4 Types of cash flow 10.5 Cash flow time line 10.6 Future value and present value of single cash flow 10.7 Solving for interest rates and time period	20

		10.8 Annuities: Meaning and types 10.9 Future value of ordinary annuity and annuity due 10.10 Present value of ordinary annuity and annuity due 10.11 Solving for annuity payments, interest rates and number of periods 10.12 Present value of perpetuities 10.13 Future and present value of uneven cash flows 10.14 Semi-annual and other compounding periods 10.15 Loan installment and loan repayment schedule	
Total			**120**

4.2 Grade 12

S. N.	Content Area	Elaboration of Contents	Working Hours
1	Introduction to Business Finance	1.1 An overview of business finance 1.2 Relationship of finance with economics and accountancy 1.3 Roles and responsibilities of a financial manager 1.4 Ethical concerns in financial decision	10
2	Financial Statements and Reporting	2.1 Nature of financial statements 2.2 Need for financial statements 2.3 Major components of financial statements: balance sheet, income statement, cash flow statement, statement of changes in equity structure and note to accounts 2.4 Common size statements 2.5 Annual report and its major components 2.6 Users of financial statements	8
3	Financial Analysis	3.1 Uses and importance of financial ratio analysis 3.2 Concept of index analysis 3.3 Types of ratios – Liquidity (current ratio, quick ratio), turnover (inventory turnover ratio, receivable turnover ratio, fixed assets turnover	12

		ratio, total assets turnover ratio), leverage (debt ratio, debt to assets ratio, equity multiplier), profitability (net profit margin, gross profit margin, return on assets, return on equity) and market value (price-earnings ratio, market to book ratio) 3.4 Du-pont system 3.5 Limitations of ratio analysis	
4	Source of Fund	4.1 Sources of capital/fund; on the basis of time (short term vs. long term); on the basis of ownership (debt vs. borrowed) 4.2 Short term sources: types, advantages and disadvantages 4.3 Debt: features, advantages and disadvantages 4.4 Preferred stock: features, advantages and disadvantages 4.5 Common stock: features, advantages and disadvantages	15
5	Capital Structure	5.1 Capital structure and financial structure 5.2 Meaning and features of optimal capital structure 5.3 Concept of business risk and financial risk 5.4 Break-even analysis: Determining operating BEP	13
6	Bond and Stock Valuation	6.1 Meaning and key characteristics of bonds 6.2 Valuation of bonds: Perpetual bonds, zero coupon bonds, coupon bonds with finite maturity 6.3 Bonds with semiannual coupons 6.4 Meaning and key features of common stock 6.5 Book value of common stock 6.6Common stock valuation: Single holding periods Multiple holding periods 6.7 The dividend discount model: zero growth model and constant growth model.	12
7	Capital Investment Decision	7.1 Concept, features and importance of investment decision 7.2 Types of investment proposals: Independent, dependent, mutually exclusive, expansion, diversification and replacement 7.3 Steps involved in the evaluation of investment	16

		7.4 Payback period and net present value	
8	Working Capital and Current Assets Management	8.1 Concept and types working capital 8.2 Importance of working capital 8.3 Determinants of working capital 8.4 Gross working capital and net working capital 8.5 Cash conversion cycle 8.6 Current assets management: concept and importance of cash management, receivables management and inventory management	14
9	Dividends and Dividend Payment Procedure	9.1 Concept and forms of dividends 9.2 Dividend payment schemes: stable, constant pay-out and low regular plus extra 9.3 Dividend payment procedure 9.4 Factors influencing dividend decision	10
10	International Finance	10.1 Multinational corporations 10.2 Multinational versus domestic financial management 10.3 Exchange rates and quotation 10.4 Computation of cross exchange rate 10.5 Trading in foreign exchange: Concepts of spot rates and forward rates	10
	Total		**120**

5 Suggested Practical/project Activities

Some examples of practical/project work activities to be performed by students of Grade 11 and Grade 12.

Grade 11			
S. N.	**Content Area**	**Project Works**	**Working Hour**
1	Introduction to Business Finance	Visit any two business firms of your locality and the web page of any one organization and note their goals.	3
2	Business Entity and Financial Environment	Visit any five business firms of your locality. List out their characteristics and classify them into the categories of sole proprietorship, partnership, company.	2
3	Financial Assets	Select an organization of your choice and fill in the	

<table>
<tr><td></td><td></td><td>following table with reference to the selected organization.<table><tr><th>Examples of real asset</th><th>Examples of financial assets</th></tr><tr><td></td><td></td></tr></table></td><td>5</td></tr>
<tr><td>4</td><td>Financial Markets</td><td>4.1 Suppose you want to purchase shares through primary market, list out the requirements and steps to be followed while investing in primary market.
4.2 Visit a brokerage firm and collect KYC form to trade in secondary market. List out the documents required for KYC, fill in the form properly and attach required documents.
4.3 List out requirements and steps to be followed while purchasing shares in secondary market.</td><td>6</td></tr>
<tr><td>5</td><td>Commercial Banks</td><td>5.1 Visit a branch of a commercial bank/development bank/finance company in your local area and list out the functions it performs on the basis of an interview with one of the officers of the organization.
5.2 Visit the website of a commercial bank/development bank/finance company and list out the services offered by the institution.
5.3 Visit a financial institution and collect the application form for opening a saving account. List out the documents required to open a saving account, fill in the form properly and attach the required documents.
5.4 Visit websites of Nepal Rastra Bank (NRB) and list out:
- Number of commercial banks / Class A financial institutions
- Number of Development banks/ Class B financial institutions
- Number of finance companies/ Class C financial institutions</td><td>5</td></tr>
<tr><td>6</td><td>Micro Finance and Cooperatives</td><td>Is there any branch of micro finance and or cooperative in your locality? If yes, list out the services offered by them; then compare and contrast the functions of micro finance and saving and credit cooperative.</td><td>5</td></tr>
<tr><td>7</td><td>Risk and Insurance</td><td>Prepare a list of various types of risks and their examples.</td><td>6</td></tr>
</table>

8	Life and non-life Insurance	8.1 Form a team of five to seven students in your class. Visit any branch (or website) of life insurance company and collect information from the company branch (or website). Conduct an interview with the manager of the company to get information about various life insurance policies offered by the company. Present a report covering the type of each policy and their features in your class in the presence of your subject teacher. 8.2 Visit any branch of non-life insurance company in your local area (or website of non-life insurance company if branch is not accessible). Gather the information relating to various non-life insurance policies offered by them. Discuss and prepare short report on the type of risks coverage under those policies.	
9	Mutual Fund, Pension Fund and other Financial Service Companies	Visit a merchant banker (or website of a merchant banker); then list out the functions and services offered by the institution.	5
10	Time value of money	List out the short-term and long-term interest rates charged by any two financial institutions on the money they lend and make a comparison showing how and why they are different.	3
	Total		40

Grade 12			**Working Hour**
S. N.	**Content Domain/area**	**Activities**	
1	Introduction	Visit a nearby organization in your locality and interview the manager about his/her responsibilities and the importance of finance in Nepalese organizations and prepare and present a report to the class.	1
2	Financial Statements and Reporting	Collect the daily newspaper and find out the financial statements in the business pages or annual report, then list out the items included in the balance sheet, the income statement, cash flow statement, statement of	2

		changes in equity structure and note to accounts separately.	
3	Financial Analysis	Collect the daily newspaper and find out the financial statements in the business pages or annual report, then calculate the ratios you studied in the text separately for two firms of the same industry and compare the financial health.	4
4	Source of Fund	Visit a nearby organization in your locality and interview the manager about the sources of fund in their business. List out them on the basis of interview. Calculate the percentage of each source and write the advantages and disadvantages of them.	5
5	Capital Structure	Watch the business news in television for a month and list out the companies with the long-term source of financing. Find out the sources of long-term capital (Why are the companies interested in using those sources?)	5
6	Bond and Stock Valuation	6.1 Visit the website of a company that has issued bonds (or website of issue manager), download prospectus and list out the key features of bonds. 6.2 Calculate the value of a bond issued by any Nepalese company and justify your required rate of return.	4
7	Capital Investment Decision	A mini case can be provided with the data.	6
8	Working Capital and Current Assets Management	A mini case can be provided with the data.	4
9	Dividends and Dividend Payment Procedure	Collect the newspaper for the last few days and find out the news related to the dividend distribution. If the related news is not found in newspaper, visit the website of listed companies on Nepal Stock Exchange and find out the companies that have the history of dividend payment. Collect the information from there; and list out the types of dividend and explain the dividend payment procedure.	5
10	International Finance	A real case can be exercised with the help of the exchange rates published by Nepal Rastra Bank in daily newspapers or website.	4

	Total	40

6. Learning Facilitation Method and Process

So as to facilitate the content of the course, the teacher will use a variety of student centered methods and strategies so that they will develop the habit of independent learning. Besides other subject specific methods, the following and methods and techniques could be employed in delivering the course.

- Case observation
- Field visit
- Library assignment
- Project work
- Group and individual work
- Presentation
- Lecture and discussion

7. Student Assessment

Assessment is an important aspect of teaching learning process which will both serve the purpose of assessment for learning and assessment of learning. Both formative and summative evaluation will be carried out to measure the students' learning. Formative assessment is mainly to bring improvement in students' learning and it is to be carried out in the continuous basis. The following strategies are to be utilized for the formative assessment.

- Assessment of students' everyday learning
- Presentation of home assignments by the students
- Students' participation in discussions
- Project work completion
- Weekly, Monthly and trimester tests

Summative assessment will be carried out through internal and external evaluation.

A. Internal Evaluation

Student's knowledge, skills and competencies will be measured through internal evaluation in both the Grades 11 and 12. As an internal evaluation, two trimester examinations will be conducted. The internal evaluation carries 25 percent of weightage for final evaluation of student achievement. The following table shows the criteria for the internal evaluation:

SN	Criteria	Marks
1	Classroom participation (Daily attendance, home assignment, classwork, individual, group and class participation in learning, participation in academic and other activities)	3
2	Trimester exam (3 marks from each trimester exam)	6
3	Project work, project report and presentation	16

	Total	25

B. External examination

External evaluation of the students will be based on the written examination. It carries 75 percent of the total weightage. The types and number questions will be as per the test specification chart developed by the Curriculum Development Centre.